MACHINE AND TOOL ENGINEERING

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RENEGOTIATION:
Machine Tool Doom?
PAGE 109

NOVEMBER, 1943

The TOOL ENGINEER

Official Publication of
American Society of Tool Engineers

Keeping war production in high gear!

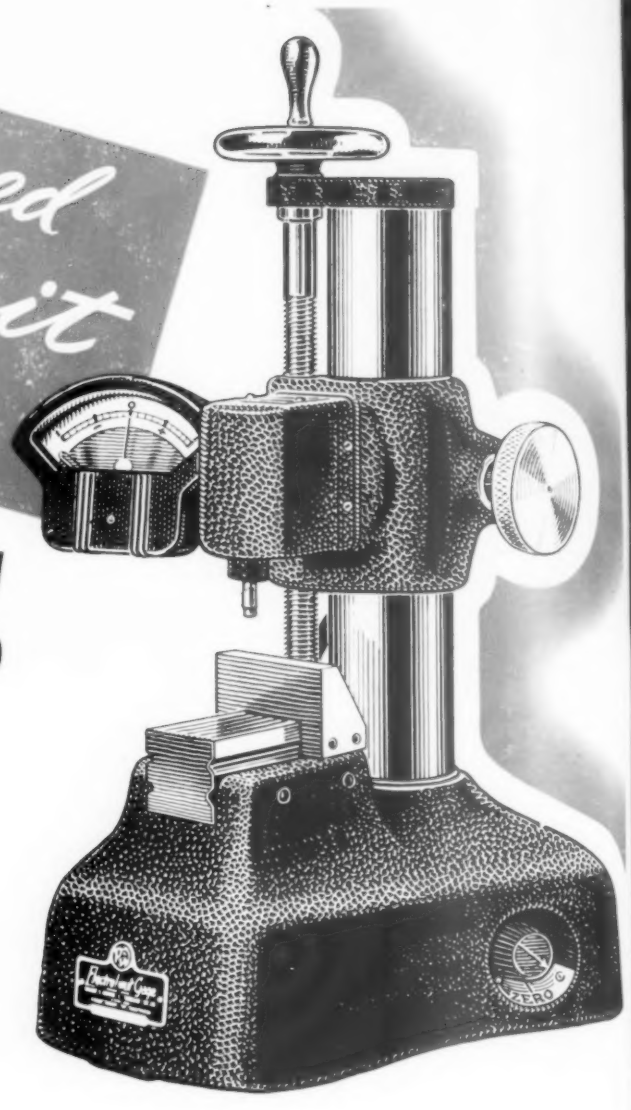
WHEREVER sintered carbide tools are used for rapid metal removal, DI-MET diamond abrasive wheels keep their edges in cutting trim. Recommended for fast, accurate and economical grinding of carbide tipped lathe tools, milling cutters, reamers, broaches, counterbores and all other applications of tungsten carbide inserts.

DI-MET Resinoid Bonded Diamond Abrasive Wheels are made in all standard types and in diameters up to and including 6". Prompt deliveries.

LKER MANUFACTURING COMPANY
1121 Border Street, Torrance, California
NUFACTURERS OF DIAMOND ABRASIVE WHEELS

PUBLISHED BY THE BRAMSON PUBLISHING COMPANY

Do you need Electrolimit Gages?



We expect to have a few available soon, subject to priority rulings and prior sale

SUBJECT to prior sale and the usual priority requirements, a limited supply of Pratt & Whitney Electrolimit Gages may shortly be available *for prompt delivery*. These will be brand-new, ready-to-use P&W External Comparators for outside dimensions up to 4 inches, and a few larger ones with capacity up to 10 inches.

You know the P&W Electrolimit Gage. It is doing 24-hour duty in hundreds of war shops . . . checking the accuracy of vital parts. It doesn't miss. When its needle says ok, that part will assemble accurately, and later perform smoothly on some distant battle front. And best of all, when we some day go back to peace time production, this same gage will continue to work with no change whatever! It has a thousand and one applications. You'll find it right at the machine for the operator's use — and you'll find whole batteries at work in final inspection departments.

If you are interested, we suggest you phone or wire *now* . . . this anticipated selection will be sold to first-comers in their priority sequence. Address our nearest branch office, or contact our headquarters . . . Pratt & Whitney, Division Niles-Bement-Pond Company, West Hartford, Conn.

The P&W Electrolimit Gage — a high-speed, high-accuracy inspection instrument. Through its mechanical-electrical mechanism, it magnifies errors up to 20,000 times . . . makes checking swift and sure. Quickly set with a master or a set of gage blocks, it registers variations over and under the setting with readings directly in "tenths" or finer. Use it for any and all external dimensions within its range. We'll gladly send you descriptive literature.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

There is no better paying investment than the right tools for the job.

STANDARD

ACCURATE as a Bench Comparator but FAST and PORTABLE!

HERE'S A GAGE that combines PORTABILITY with speed in use and absolute accuracy on dimensions as fine as .0001". STANDARD Dial Snap Gage is portable and easy to handle as a conventional snap gage, yet has the quantitative accuracy of a stationary instrument.

Adjustable gaging pin has a serrated flat surface tipped with tungsten carbide that practically *defies wear*. Opposite movable pin has mushroom top, also tungsten carbide. Point-and-plane construction assures continued, accurate readings whether instrument is set by cylindrical or flat standards.

STANDARD Dial Snap Gages speed inspection, guard against rejects and material spoilage and eliminate human variations not only on precision work but also where tolerances are comparatively liberal. Write for Special Bulletin.

FEATURES

1. High precision indicator approximately 1" in diameter graduated .0001". Bezel rotates for convenient setting.

2. Measuring anvil tipped with tungsten carbide. Indicator protected against shock by sudden applications to measuring pin.

3. Tungsten carbide tipped adjustable anvil has flat lapped serrated surface. Minute chips and dust readily clear from it, helping insure accuracy.

4. Adjustable, spring-cushioned safety stop reduces jar, helps hold work in correct gaging position.

5. Air space between grip and body of instrument protects against hand heat, further safeguards accuracy.

ARMY E NAVY

STANDARD GAGE CO., INC., Poughkeepsie, N.Y.

THE BETTER FASTENING METHOD

SOCKET SCREWS *by* HOLO-KROME

Fastening problems are efficiently solved by using Holo-Krome FIBRO FORGED Socket Screws . . . More compact design made possible . . . Reduction of weight in parts to be fastened . . . Manpower time reduced because of Internal Hex Wrenching feature — quick and positive tightening.

GUARANTEED unfailing PERFORMANCE

Save WEIGHT - SPACE - TIME

THE HOLO-KROME SCREW CORP., HARTFORD 10, CONN. U. S. A.

The TOOL ENGINEER

VOL. XII T.M. REG. U.S. PAT. OFF. No. 11

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Circulation Manager

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Publisher's Letter

WE'RE back at our desk after three days of "A. S. T. E'ing" at the Indianapolis Semi-Annual Meeting. This was one of the most business-like meetings of any engineering organization I have ever attended. Grim determination in the faces of tool engineers attending and the interest manifested in the technical sessions was real proof we'll win this war. As Doug Burnside said, "These talks were . . . solutions to trying production problems now being encountered in every section of the country."

Ray Morris promised us ten minutes, but gave us an hour and a half, just before we packed our typewriter for home. Optimistically, he believes that "conversion will not be the bugaboo the boys expect." "In fact," he said, "there may be little lag at all in mass production when war output ceases."

It was enjoyable seeing many A.S.T.E. old-timers —Bert Carpenter, "Pop" Hiatt, Jim Weaver and other friends who worked hard to build the organization.

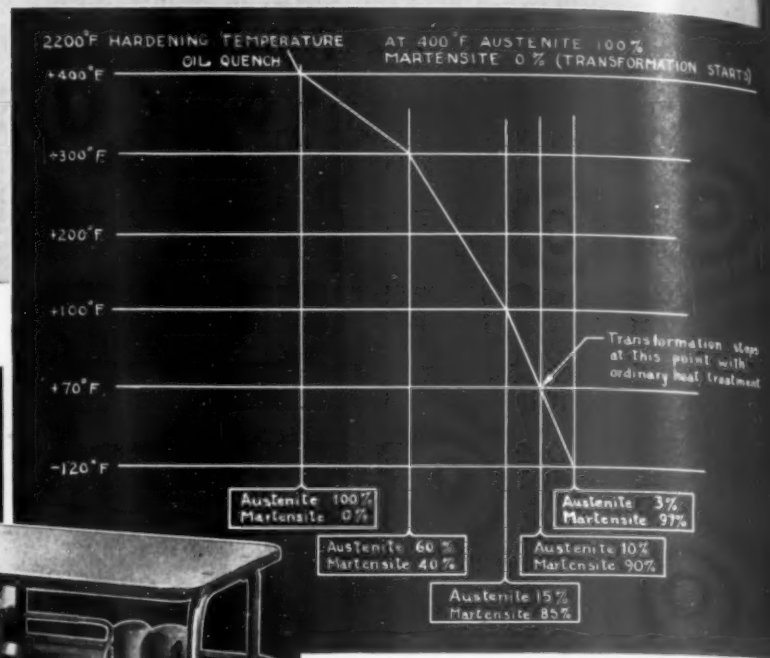
We are prouder of some issues of THE TOOL ENGINEER than others. Naturally, we try each month to beat our previous issues in quality and attractiveness of material presented. This issue, we believe, is one of our best. Leading technical feature this month is on the fabrication of hollow steel, one piece propeller blades—made from seamless steel tubing. If the delicately balanced shape of a propeller blade can be produced from tubing without too many machining and handling problems, there must be hundreds of home, farm and transportation items that offer similar production possibilities in peacetime manufacture. The picture here shows

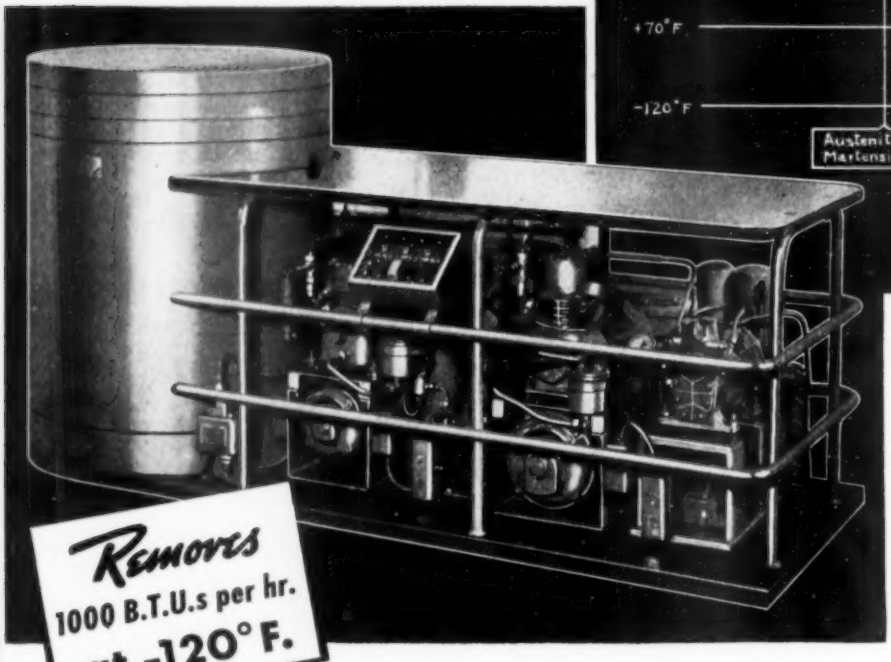
blade sections produced from chrome-moly steel tubing by the American Propeller process. This is no brief for tubing manufacturers, but I want to remind you about another war-born development—Walter Hill's (at Wolverine Tube) remarkable method of shaping or closing tube ends with a spinning die that requires no internal mandrel. This was described in our March issue, this year.

Roy T. Bramson

How Cold Treatment of Steel at -120° F. Results in Transformation of Austenite to Martensite

Provides Extra Hardness and Toughness...Relieves Stresses and Strains...Produces Uniformity of Hardness





Removes 1000 B.T.U.s per hr. at -120° F.

The above chart was developed by a prominent metallurgist showing the curve of transformation of Austenite to Martensite in metal at temperatures varying from 400° F. to −120° F.

● The Deepfreeze Cascade −120° F. Industrial Chilling Machine is finding widespread application in the hardening and stabilization of metals by cold treating at temperatures of −100° F. to −120° F. It has been found that the proper cold treatment will produce a uniformity of hardness that clearly indicates that most stresses and strains have been relieved.

The treatment of metals by the chilling method is as yet too new to understand its full possibilities, but recent tests reveal that chilling of steel at −120° F. in a Deepfreeze immediately after quenching results in a greater transformation of the retained Austenite to Martensite. With ordinary heat treatment the transformation stops when the steel reaches room temperature, leaving approximately 10% Austenite content. However, chilling to −120° F. in a Deepfreeze results in a nearly complete decomposition of the retained Austenite.

Deepfreeze Cascade -120° F. Industrial Chilling Machine for the Shrinking, Testing and Treating of Metals . . .

In addition to the treatment of metals, Deepfreeze Chilling Machines are finding many other money saving applications in a wide variety of industrial fields. The Cascade −120° F. Industrial Chilling Machine shown above has the chilling capacity for high production metal chilling of any part where large quantities of heat must be removed fast. It is adaptable to almost any metal chilling job. Let Deepfreeze engineers assist you in the application of cold treatment to your products.

Example Procedures in the Treatment of Steel by Deepfreeze Chilling Method

REX M.M. HIGH SPEED TOOL STEEL

Heat Treatment (Ordinarily Used)	Heat Treatment (Deepfreeze Method)
Pre-heat.....1550° F.	Pre-heat.....1550° F.
Hi-heat.....2160° F.	Hi-heat.....2160° F.
Quench.....(air)	Quench (air) to +120° F.
Draw.....1025° F. (2 hours)	Deepfreeze to −120° F. (3 hours)
Cool to room temperature	Warm to atmosphere in air
Draw.....1025° F. (2 hours)	Draw.....1025° F. (2 hours)
Rockwell Showed 63-64 C.	Cool to.....+120° F.
	Deepfreeze to −120° F. (3 hours)
	Warm to atmosphere in air
	Draw.....1025° F. (2 hours)
	Cool to.....+120° F.
	Deepfreeze to −120° F. (3 hours)
	Rockwell Showed 65-67 C.

NOTE: If the Draw is permitted to go over 1025° F. it will be necessary to repeat the Deepfreeze chilling process.

WATER HARDENED DIE STEEL—The following method is that found best adapted for cold treating water hardened die steel.

1—Heat to 1500° F. (or usual method).
2—Quench at 75° F. (or usual method).
3—Immerse at once into Deepfreeze at −120° F.
4—Draw as usual (if drawing temperature exceeds 875° F. then again immerse in Deepfreeze at −120° F.)

FINISHED PRODUCTS—For the cold treatment of finished products not manufactured by the user, the following procedure is successfully used by many firms with Deepfreeze equipment.

1—Heat to 300° F. in tempering furnace (if furnace is not available use boiling water at 212° F.)
2—Cool to atmosphere.
3—Immerse in Deepfreeze at −120° F.
4—Warm to atmosphere.
5—Repeat cycle 5 to 6 times.

Free Additional Information

For additional information on Deepfreeze equipment send for free copy of bulletin with complete details, specifications, and listing other uses.

Deepfreeze

2311 DAVIS STREET
NORTH CHICAGO, ILLINOIS

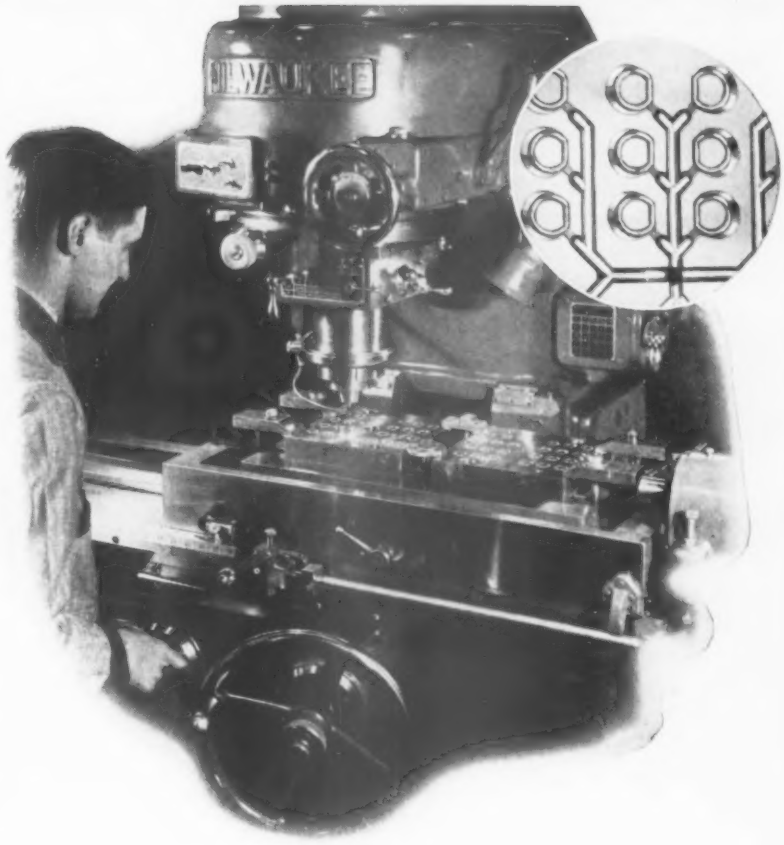
Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

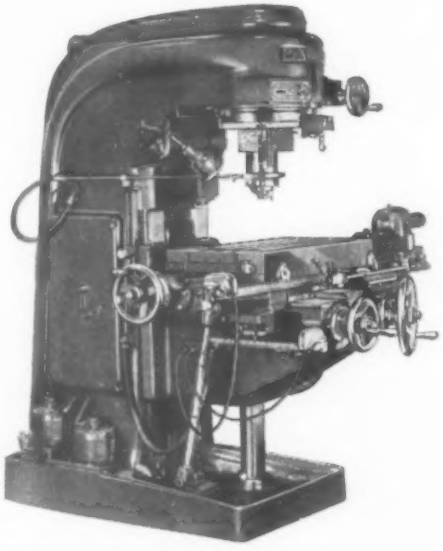
Division of Motor Products Corporation, Detroit, Michigan

24 CAVITY MOLD FINISHED IN *18* HOURS!

Estimated time required by other methods was more than 100 hours!

THE two halves of the 24 cavity mold were aligned and properly spaced on the Milwaukee Rotary-Head Milling Machine table. The first milling operation was performed on the first cavity in the back row. Then, by moving the table the proper distance — the same operation was performed on the next cavity. Since the cavities in the two mold halves were identical, this and succeeding operations were simply carried over to the opposite half of the mold. Each operation was readily performed in proper sequence and the entire 48 impressions of the 24 cavity mold were machined completely at a single set-up in 18 hours.





KEARNEY & TRECKER'S
ROTARY HEAD MILLER

The Most Versatile Machine Ever Designed for Mold and Die Work

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements—possible only with this machine—transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

•

Write for Bulletin No. 1002C for complete information on the Milwaukee Rotary-Head Miller and the accurate and rapid production of all types of molds and dies for plastics.

Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

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•
Milwaukee Midgetmill
•
Milwaukee Speedmill

P&J *Automatic* CHUCKING EQUIPMENT

is doing a war time job in a Big Way

PHOTO FURNISHED BY U. S. ARMY

When the call came for war material — and duplicate parts in particular — in greater and greater quantities — P&J was ready for the unprecedented demands made on machine tools and machine tool builders.

P&J's prompt answer to the call and ability to meet it were possible because in the design and development of P&J Chucking Equipment extra capacity has invariably been provided as well as power for speeds and feeds greater than those ordinarily called for. Furthermore the inherent tooling possibilities offered in P&J machines invariably anticipate requirements. No preliminary "training period" was necessary before P&J machines were qualified for front line service in war production. These machines and the P&J organization that pioneered them are in the service of war production plants all over the nation and at the service of any plant with a problem involving duplicate parts.

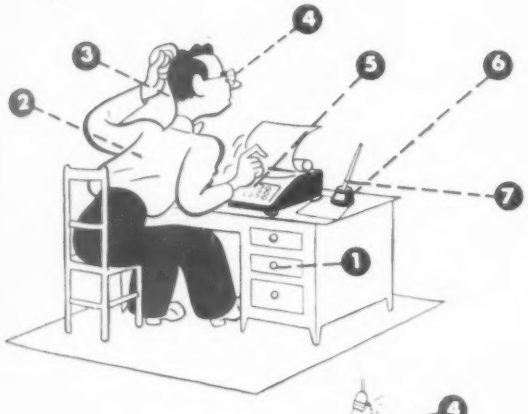
MORE MACHINE TOOLS WILL MAKE MORE MACHINE GUNS...

Buy More WAR BONDS

21 Ways that Jones & Lamson Optical Comparators help your

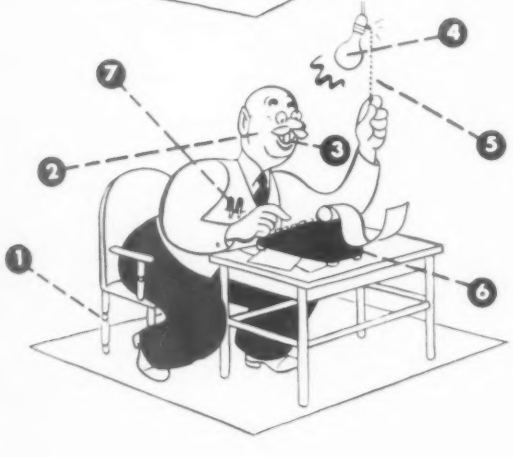
READIN'

1. Electrical equipment
2. Radios
3. Slide fasteners
4. Type faces
5. Paper making machinery
6. Button dies (plastic)
7. Matches



'RITIN'

1. Hardware
2. Textile machinery
3. Hair clippers
4. Eye glasses
5. Typewriters
6. Bottle molds and closures
7. Pen points



'RITHMETIC

1. Wood and metal cutting tools
2. Electric shavers
3. Tooth brushes
4. Light bulbs
5. Light chains
6. Adding machines
7. Automatic pens and pencils

During the past 22 years, **Jones & Lamson Optical Comparators** have been used for inspecting thousands of interesting and peculiar jobs. Readin', 'ritin', and 'rithmetic have been definitely helped, just as have the food you eat—the clothes you wear—the room you're in—the war you're fighting. Whatever product you manufacture, be it mechanical, electrical—*anything*—call in a Jones & Lamson expert to show you how you can inspect it more accurately, faster, at less cost, through the use of **Jones & Lamson Optical Comparators.**

The enlarged shadow image reveals, at a glance, the exactness of all dimensions of even the most complicated tools, parts and products.

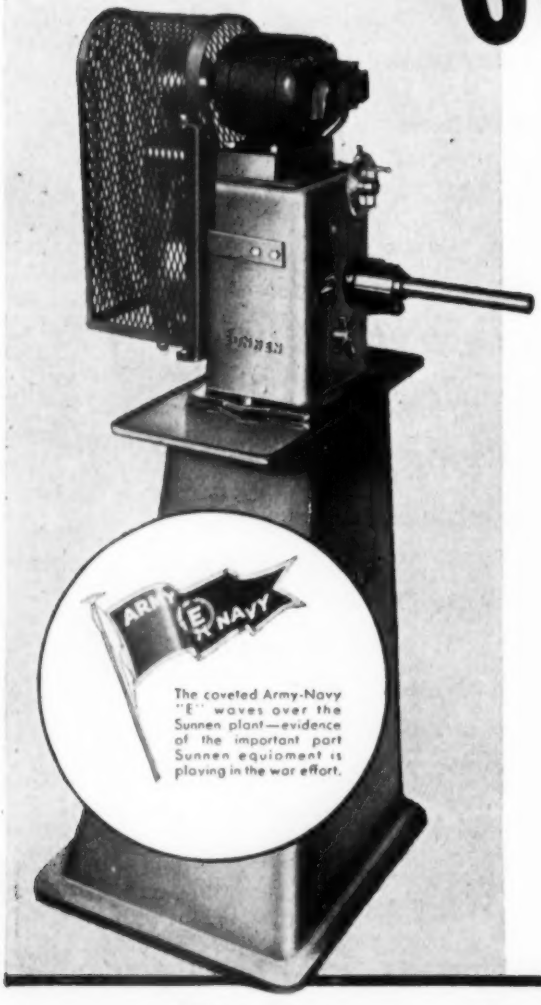
Universal Turret Lathes . Fay Automatic Lathes . Automatic Thread Grinders . Optical Comparators . Automatic Opening Die Heads

JONES & LAMSON MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.

Profit-producing Machine Tools

Sunnen Precision Honing Assures Absolute

INTERCHANGEABILITY OF PARTS!



The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

● While the Sunnen Precision Honing Machine is *guaranteed* to be accurate within "one-tenth"—*production jobs have been held to .000025"!*

This amazing accuracy — together with the super-smooth finish (of 2 to 3 micro-inches) — makes possible absolute interchangeability of parts, saving production time and conserving vital war materials!

And — the Sunnen method does not require skilled labor. Girls in "teens" can be trained to handle jobs in "tenths" in a few hours.

Consider These Important Advantages

The Sunnen Precision Honing Machine handles internal cylindrical surfaces from .185" to 2.625" in diameter. No jigs or fixtures needed — work is held in the hands.

Low in cost — economical to operate! Fast! Can be "set up" for any size in its range in less than a minute!

Facilitates duplication of sizes. Relieves big internal grinders for other jobs.

Let a Sunnen engineer check your job in your plant with this equipment. Or write for free bulletin giving detailed information.

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7932 Manchester Avenue St. Louis, Missouri
Canadian Factory: Chatham, Ontario

SUNNEN

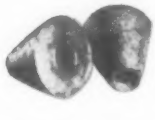
Aluminum Aircraft Link produces high finish without bell-mouthing.

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

"Strict alignment maintained between two holes."

Aircraft Valve Tappet Roller. 4-Micro finish.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

Saved time in producing a smooth, accurate finish on this bronze remote control valve body.

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

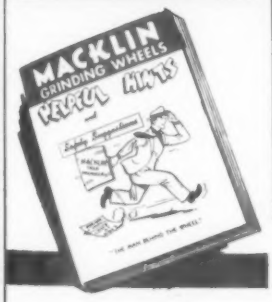
Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Hardened Steel Ring Gauge—finished to an accuracy of .000025" for roundness and straightness.

Drill Jig Bushing "Increases sales appeal of product."

MACKLIN

GRINDING WHEELS



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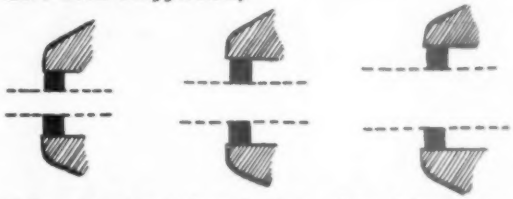
New CLECO 41-L Squeezer

with parallel jaw action

THAT INSURES BETTER RIVETING

★ The faces of the riveter arm dolly and the anvil arm dolly of the Cleco 41-L Alligator Squeezer are *always parallel regardless of the amount of gap.* This exclusive feature prevents disalignment ("clinched rivets") and loss of rivets; it insures tight rivets with uniform heads, and does not cause distortion in the surrounding metal. ★ The 41-L is new in design, but is built to the same uncompromising quality standards that have distinguished Cleco Tools for so many years. This squeezer is light and powerful; it weighs only 5½ lbs., is 12¼" long, and has a ⅛" rivet capacity. The working gap is 15/16", with full opening of 1½". It is equipped with automatic return throttle, and adjustable pressure "pop-off," as well as return limit stop on alligator jaw. ★ To meet your wartime production schedule you can't afford to be without this unique squeezer. *Write now for complete information.*

● These sketches show how the faces of the dollies on an ordinary squeezer are parallel when the gap is small. But as the gap increases, the faces cease to be parallel. (For the purposes of illustration, the angles have been exaggerated.)



● In contrast, note how the faces of the dollies on the 41-L Squeezer are *always* parallel regardless of the amount of gap.

The New Repairable Cleco Sheetholders with Latest Design Pliers.

THE CLEVELAND PNEUMATIC TOOL CO.

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IN AIRCRAFT PRODUCTION

This Baker Machine Works on Exhaust and Intake Rocker Arms for Aircraft Engines.

Model 36-HO

Write today for complete information on this machine

BAKER

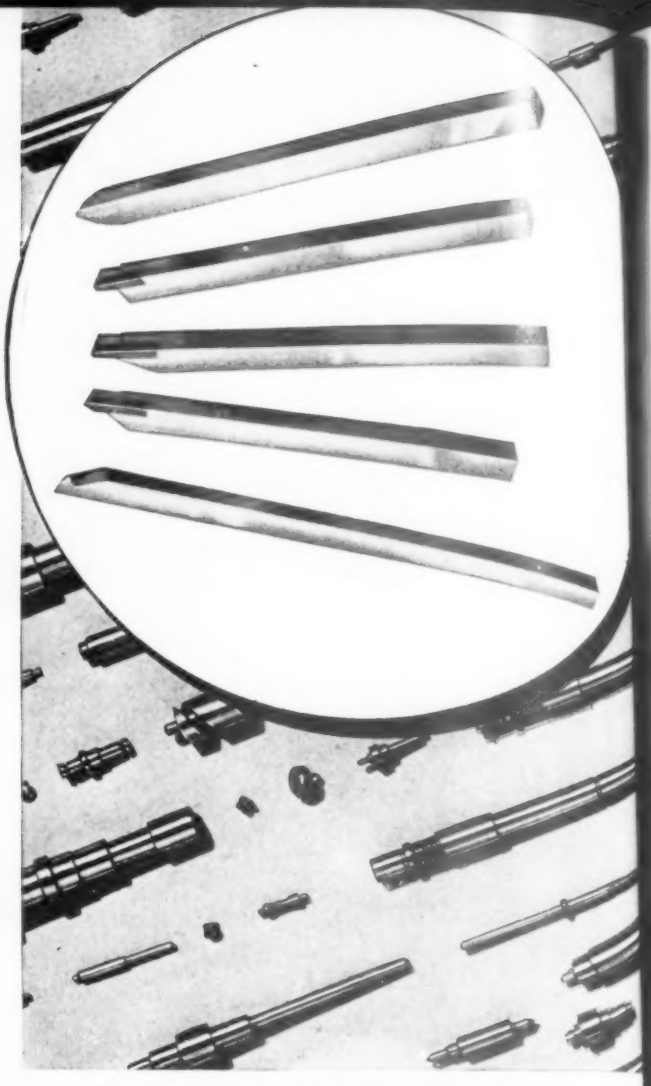
This vertical CLEANLINE heavy duty single and multiple spindle drill with hydraulic feed, is set up to drill, counterbore, rough, and finish ream. Used by the manufacturer of one of the leading aircraft engines, this machine takes part in the manufacture of exhaust and intake rocker arms. In this case, it is furnished with an 8-spindle, fixed center multiple head and the base with a 40 inch diameter shallow type ball bearing hand index table.

BAKER BROTHERS, INC. TOLEDO, OHIO, U.S.A.

DRILLING • BORING • TAPPING • CONTOUR GRINDING MACHINES

SIMPLE

STANDARD, LOW-COST TOOL BITS DO ALL JOBS *like these...*



GORTON 16-A produces the most complex precision parts with only the simplest single-point tool bits—either high-speed steel or carbide-tipped.

SIMPLE

SET-UPS . . . ADJUSTMENTS . . . OPERATION . . . All vital parts and controls instantly accessible—insures simple, quick, low-cost set-ups. Centralized fingertip controls provide infinitely variable spindle speeds and cam feeds—*no speed or feed gears to change.* Extreme accuracy and exceptional finish assured; subsequent finishing operations usually eliminated.

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The Gorton 16-A produces an almost endless variety of short or long slender parts—simple or complex—complete in *one* operation. It does step and contour turning and chamfering in multiple diameters—centers, drills, threads, slots—tapers . . . knurls . . . back recesses . . . pivot points . . . etc.

WIDE RANGE OF WORK

TURNS ANY DIAMETER from .005" to 7/16" Bar Capacity of Machi

GEORGE GORTON MACHINE CO.
1322 Racine St., Racine, Wis.

Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic Screw Machine.

Name ..... *Title* .....
Company .....
Address .....
City ..... *State* .....

GET THE FACTS NOW

Mail Today for FREE Bulletin

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GORTON

GEORGE GORTON MACHINE CO.

1322 RACINE STREET, RACINE, WISCONSIN, U. S. A.

Just a minute...

..telephone your I S D First!

Picking up your receiver *can* produce results faster than picking up a pencil. And when "results" means the prompt delivery of parts or supplies on which your full-scale production depends, you'll find it pays all ways to telephone your Industrial Supply Distributor *first.*

Because—minding *his* business means keeping his mind on *your* business. Your Distributor knows what materials you must have to keep your operations on schedule. He orders ahead from the factory for you and for all his other customers. He buys on priority—he buys as much as he can—he buys as often as he can.

Co-operate with your Industrial Supply Distributor—check with him ahead of your needs—give him opportunity to co-operate with you. It's good strategy on the home industrial front—in wartime and every other time.

ARMY NAVY ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
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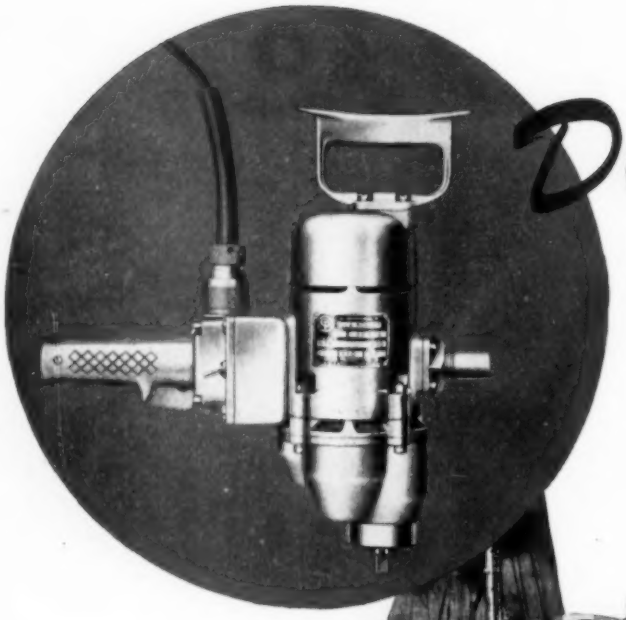
"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

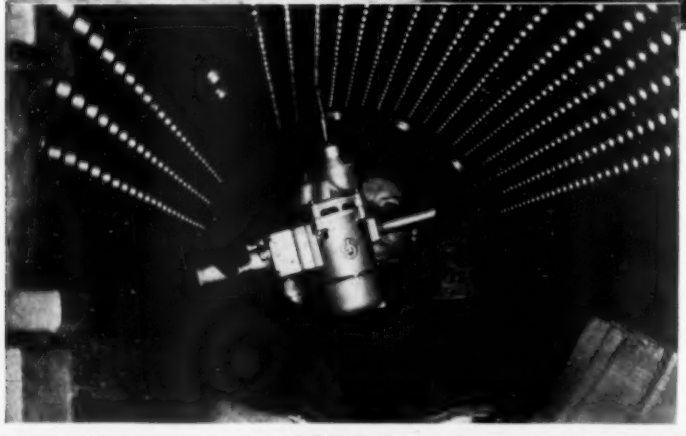


Developed Especially

FOR

ROLLING TUBE ENDS IN D.E. BOILERS

(Official U. S. Navy Photograph)



CP No. 939 Electric Reversible Flue Roller, while designed especially for builders of D. E. vessels, is ideal for rolling tube ends in any small boiler drum. Rolls 1″ or 1½″ tubes. Only 14½″ overall. Weighs only 17½ pounds. Write for complete data.

★★★★★★★★★

PNEUMATIC TOOLS
ELECTRIC TOOLS
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ROCK DRILLS

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General Offices: 8 East 44th Street, New York 17, N. Y.

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AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
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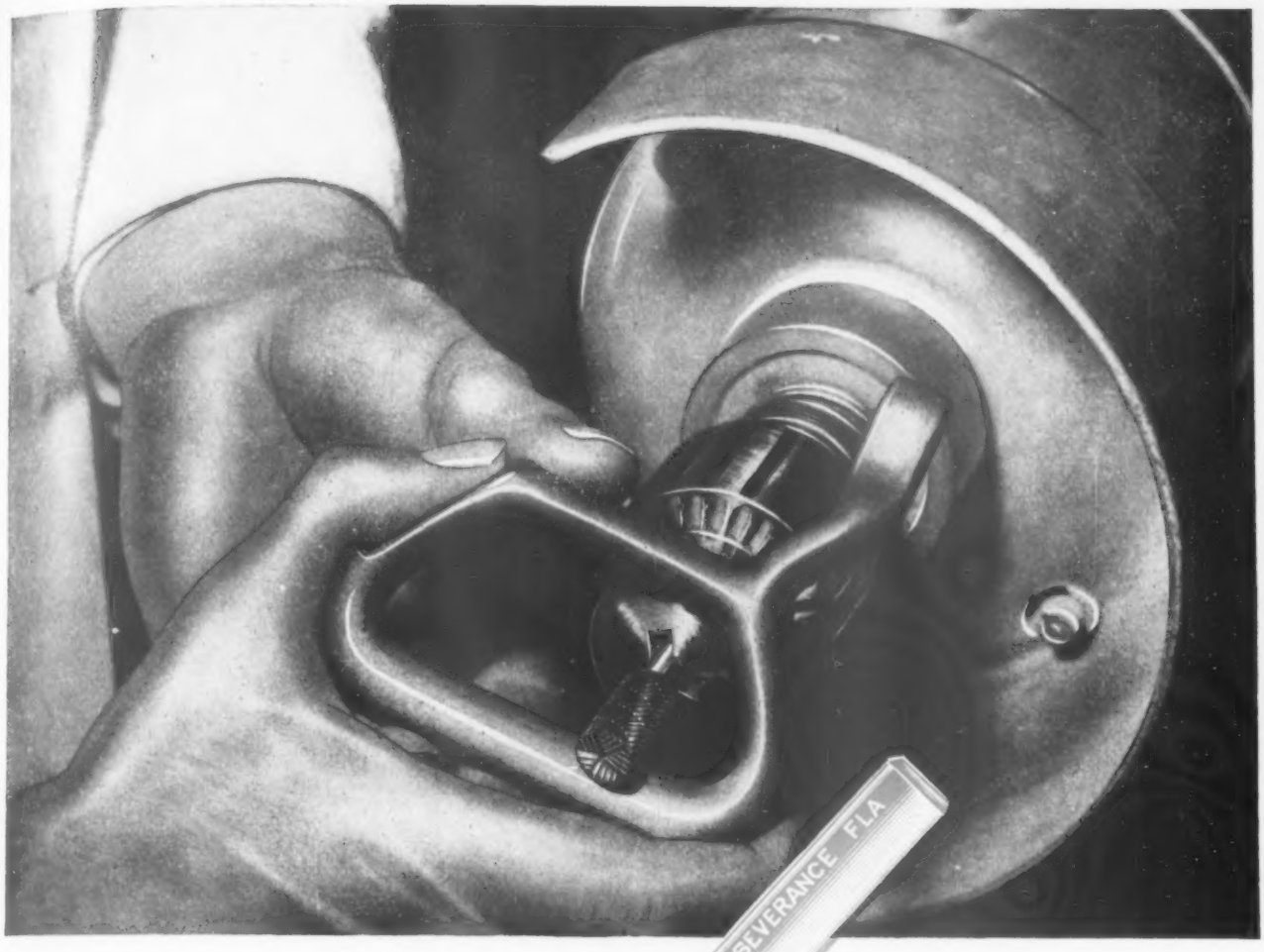
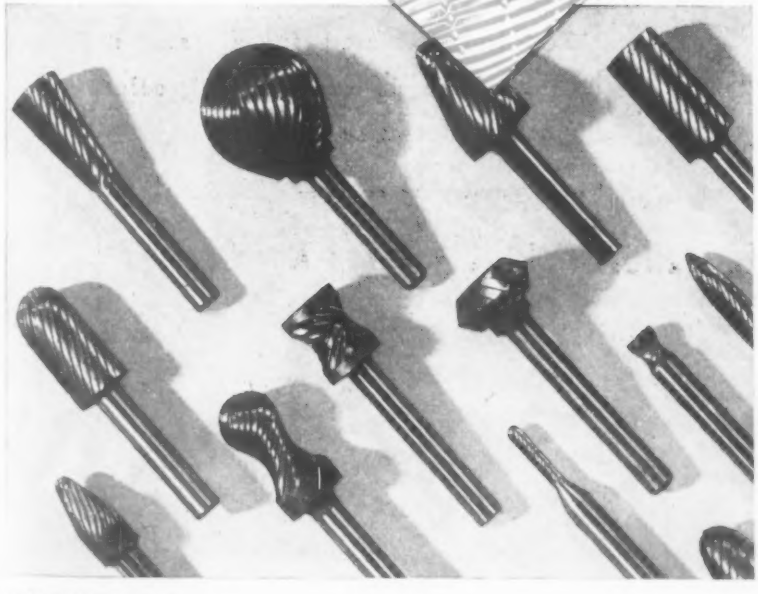


SEVERANCE TOOLS ON STATIONARY SET-UP SPEED FINISHING OF SMALL PARTS



Above you see a Severance Midget Milling Cutter being used in a stationary set-up which many manufacturers of small parts have found to be a great time saver. The part is held in the hand, the tool is held in a chuck on almost any type of bench lathe, polishing unit or flexible shaft mounted in a vise.

No matter how they are used, Severance Midget Milling Cutters do the job of finishing faster and cleaner than any other type of rotary tool. They take deep, sharp bites and can be successfully reground scores of times.

In addition to high speed cutters, Severance "Carbide" Midget Milling Cutters are also now available in a wide range of shapes and sizes. Carbide cutters are recommended for metals or other materials having an extremely hard, abrasive, scale. Write for complete facts about how Severance Midget Milling Cutters can help you speed up your cleaning and finishing operations.

Severance

SEVERANCE TOOL INDUSTRIES, INC., SAGINAW, MICHIGAN. PLANTS IN LONG ISLAND CITY, NEW YORK; DETROIT, MICHIGAN; FORT WAYNE, INDIANA; CHICAGO, ILLINOIS; LOS ANGELES, CALIFORNIA.

Man, that's a smooth prime coat...

"SPEC" COATING

With a Distinct Egyptian PLUS

Every specification finish we make meets Government requirements to the letter . . . but that's only one point. There's a *plus* in an Egyptian "spec" finish, an *extra value,* which shows up in handling and in results.

• AXS 946 •

For example AXS 946, a rust inhibiting primer for a wide list of ordnance items...

Brushed, sprayed or dipped, it covers bare metal with an extra-smooth, red-brown, corrosion-resistant coat which takes the final finish beautifully. Dries evenly and quickly.

For your products today — and tomorrow — an Egyptian Finish offers important plus value.

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Special correspondence on finishing problems is invited.

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IN AMERICA'S GREAT PRODUCTION PLANTS...

At Willys-Overland, great batteries of Acme-Gridley Multiple Spindle Automatics are tirelessly producing millions upon millions of ammunition parts

Plenty—

AND AHEAD OF TIME

Every day brings the end of war closer—Victory.

When that day comes, the Acme-Gridley Automatics that are doing such a big job in producing an endless supply of fighting equipment and ammunition, will be ready to work on the products of peace.

These Automatics are not merely one-purpose war production machines. They are versatile—adaptable. Retooled, they will turn out the parts for new and better cars, trucks, planes, farm machines, household appliances and business equipment—precision parts in unlimited quantity, at lower costs than ever before!

Acme-Gridleys operate at speeds as high, and feeds as fast, as modern tools will withstand.

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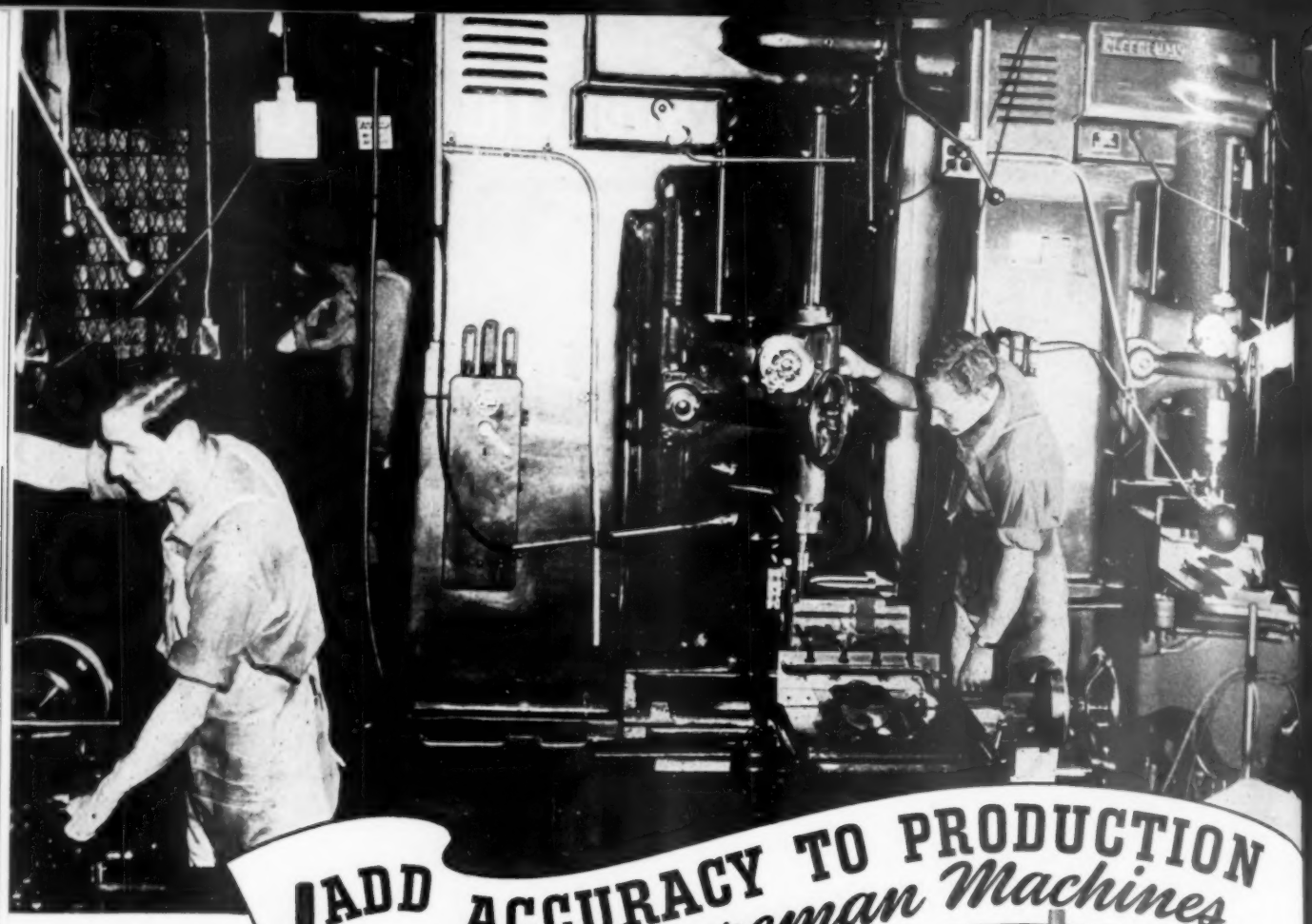
ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING



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CLEEREMAN Sliding Head Drilling Machine

Built by master craftsmen, to precision limits, CLEEREMAN Jig Borers are more than precision machines—they are accurate production machines. Not only are they at work in tool rooms, but also on small lot production, giving duplication of extreme accuracy at low cost.

CLEEREMAN Drilling Machines, made in round column and box column types, combine accuracy with great reliability in helping produce vast quantities of vital war equipment.

Write for Catalogs!

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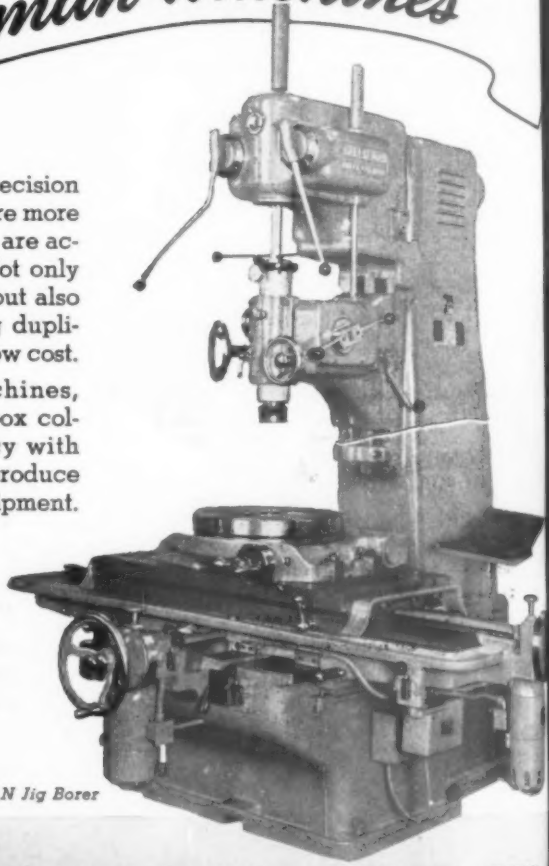

CLEEREMAN Jig Borer

BRYANT MACHINERY & ENGINEERING COMPANY

Associated with **CLEEREMAN MACHINE TOOL COMPANY**

General Sales Offices **400 W. Madison St. • • Chicago • Ill. • U. S. A.**

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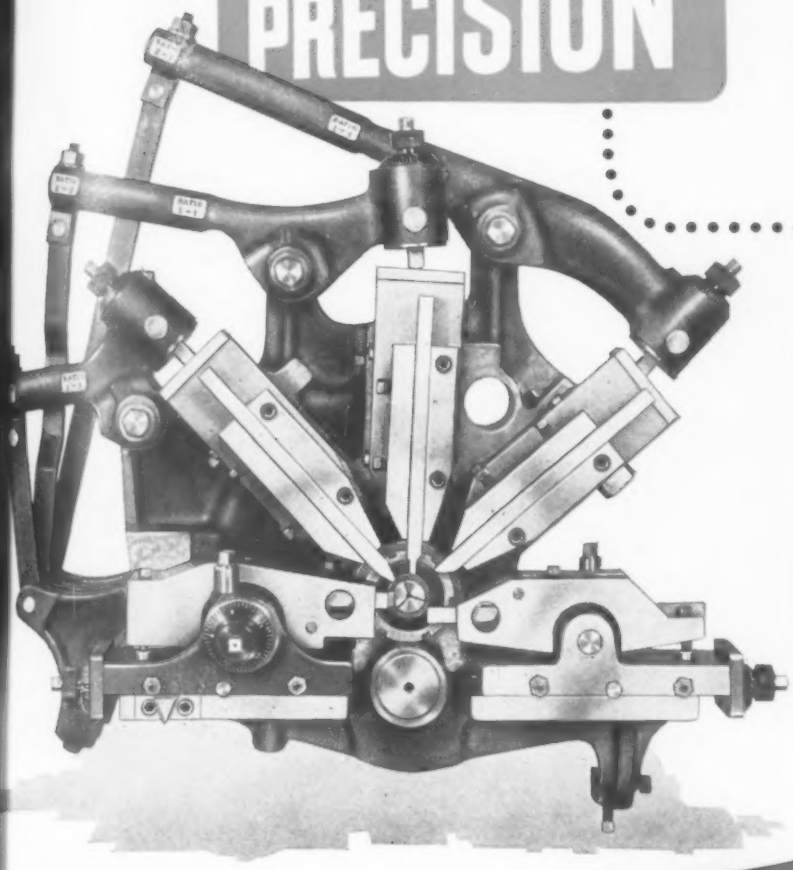
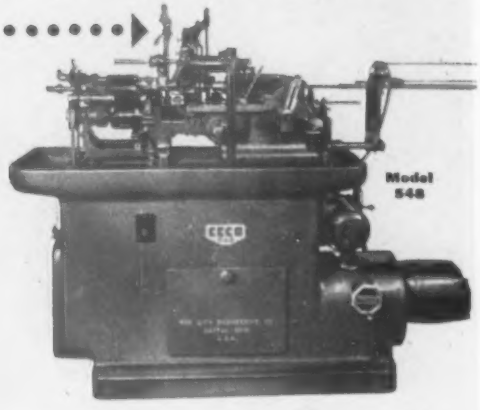


CECO

SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES



Highlight Features!

BAR CAPACITY: ⅜" and ½"

4 or 5 RADIAL TOOL SLIDES.

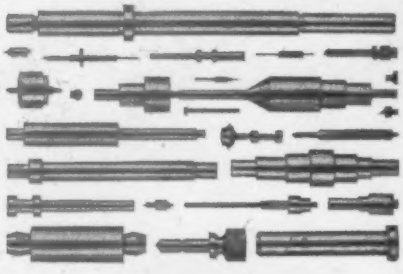
MAXIMUM TURNING LENGTH: 4" with flat cam.

MASTER SPEED RANGER: Varies Spindle speed from 675 to 7500 R.P.M. at the turn of a handwheel.

PRECISION ROLLER BEARING SPINDLE: Always in adjustment.

CONSTANT RISE FEEDING MECHANISM gives extreme feeding accuracy.

Serving some of America's greatest precision-makers, including Norden, Kollsman, Sperry, Bendix and many others, the Ceco Automatic is revolutionizing the mass production of small intricate parts—cutting tool costs, speeding the set-up and producing *one-operation precision work* with amazing economy and efficiency.



THIS BOMBSIGHT PINION SHAFT
IS AN EXAMPLE OF CECO'S
ONE-OPERATION, HIGH-SPEED PRECISION PRODUCTION

Produced by Ceco *in one operation* instead of three formerly required, and with single tip tooling, thereby eliminating form tools commonly used, is the Bombsight part reproduced above.

Shown on this page are a few of the hundreds of parts Ceco produced in *one operation* with extreme accuracy and high finish. Odd shapes and multiple diameters, also complicated forms, including tapers, bevels, radii, etc., are Ceco-produced with single tip tools. Result—quick set-up, low cost, and faster high precision production of intricate parts. For information and literature write:

THE CITY ENGINEERING CO.
DAYTON, OHIO

Since 1909, Designers and Builders of Tools, Dies, Jigs, Fixtures, Gages and Special Machinery.

even spilled milk is good for something!

YOUR tool and die failures need not be a total loss. Now that you know what you don't need, let us suggest a solution for many of these problems.

If you have made the mistake of using a tool steel that is tough to machine, investigate Graphitic Steels. Their easy machinability resembles that of cast iron. If your dies and tools are subject to terrific abrasion and are wearing out faster than you think they should, ask about Graphitic Steels' wearing qualities. If you are having trouble with distortion in the thin sections of your dies, these same steels will solve your problems.

Ask for your copy of the new Graphitic Booklet which gives complete technical and performance data. The Timken Roller Bearing Company, Canton, Ohio. Steel and Tube Division.

For Victory--
For Economy--
You will find nothing better than Graphitic Tool and Die Steels for easy machinability and resistance to wear and distortion.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
GRAPHITIC STEELS

There's no substitute for EXPERIENCE!

Ex-Cell-O's wide experience in designing and building special machines to increase output and lower costs assures you practical advantages in your immediate or near future production

Increased production attained in precision machining of this aircraft crankcase on the above Ex-Cell-O special-purpose machine.

You have a substantial background of experience to draw from when you bring to Ex-Cell-O your problem in the *precision* machining of metal parts on a high production basis . . . whether it concerns an immediate war production job or a future product you are now planning. The more economical production of accurate metal parts necessitates single-purpose machines of improved efficiency, capable of giving greater output and reducing unit cost. For years Ex-Cell-O has been an acknowledged leader in the field of special-purpose machines . . . *precision* machines with exclusive features that represent the utmost in accuracy, production, operating ease, rigidity, and durability. This is why you should utilize Ex-Cell-O's experienced engineering and manufacturing facilities. Ex-Cell-O has representatives in all of the nation's principal manufacturing centers. Consult the one nearest you, or write to Ex-Cell-O Corporation Head Office in Detroit.

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Precision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT PURE-PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS

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"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

★ . . . . . ***Especially valuable on jobs like the one illustrated.***

THIS is an excellent example of accurate surface grinding of pump body parts on a No. 18 Blanchard Surface Grinder.

These pump parts are held magnetically on a 36″ chuck and work is held to very close limits giving a finish suitable for final lapping operation.

The material is high strength forged steel and .004″ is removed from each side, to limits of ±.0003″. Forty pieces 10⅝″ long, 5⅛″ wide and .756″ thick (80 surfaces) are produced pre hour.

The BLANCHARD MACHINE COMPANY

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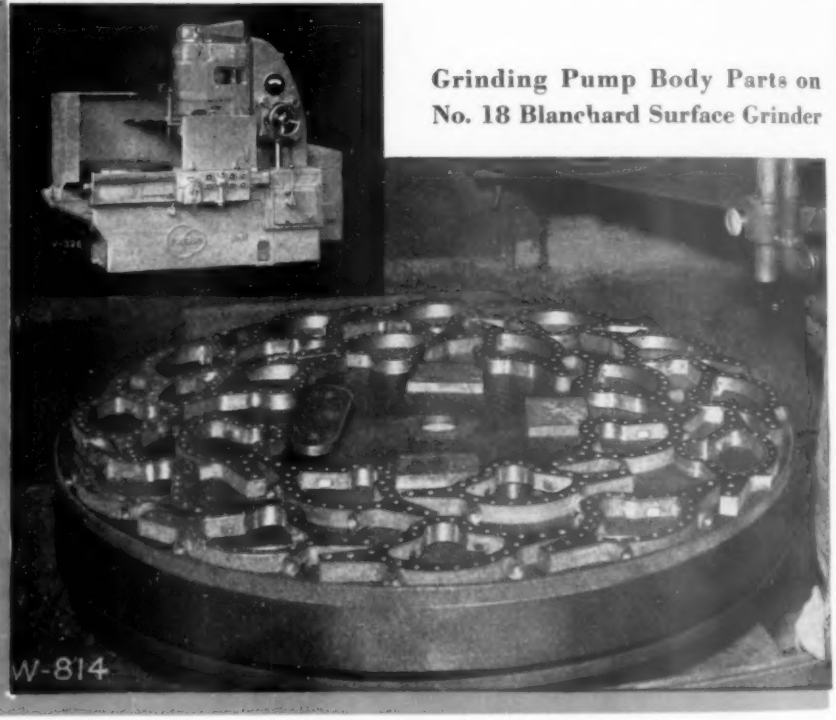
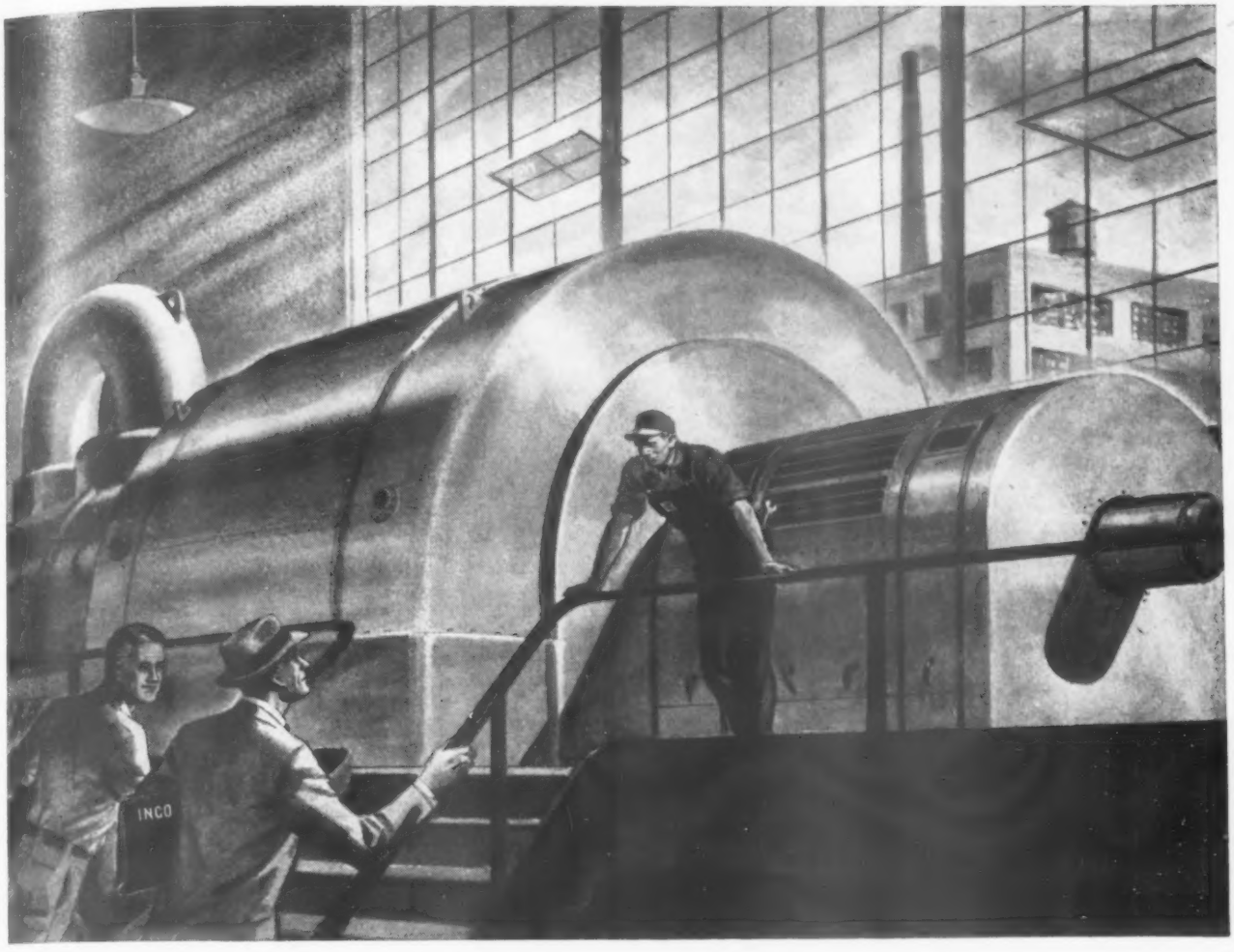


Grinding Pump Body Parts on No. 18 Blanchard Surface Grinder

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



NICKEL AIDS THE POWER INDUSTRY

to KEEP 'EM OPERATING!

In this day of acute shortages of almost everything, power plant engineers are doing an amazing job of meeting demands for power—the power to keep 'em operating.

Part of this success is due to their foresight in specifying materials that assure long life and withstand the added hardships imposed by ever-increasing peak-load demands.

With the production of tanks, guns, and planes dependent upon power capacity, Nickel makes a valuable contribution towards uninterrupted operation, through the improved properties it imparts to ferrous and non-ferrous alloys used in power plant equipment.

So today the exigencies of war illustrate more clearly than ever the simple truth of the familiar axiom, "A little Nickel goes a long way" toward increasing the dependability of power plant equipment, from turbine blades to high pressure valves, from flange bolts to shaft forgings.

The technical staff of International Nickel has been privileged to cooperate with the power plant engineers and Government authorities who have made possible the great increases in power on which so much of the war effort depends. INCO engineers and metallurgists offer counsel and data to all who desire assistance in the selection, fabrication, and heat treatment of ferrous and non-ferrous metals.

New Catalog Index

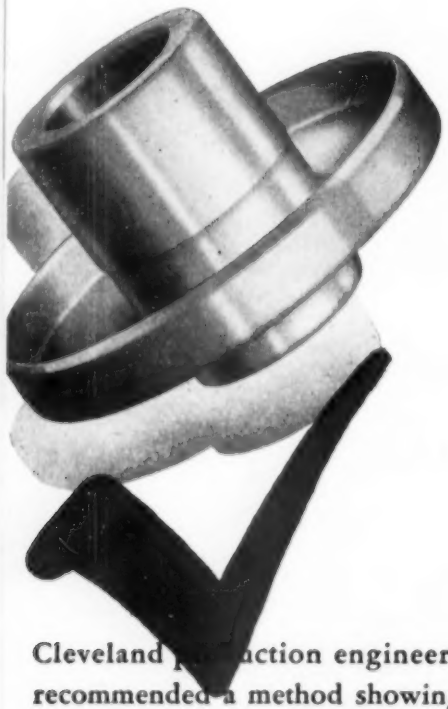
New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects—from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

* Nickel *

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

Ever Hear of CLEVELAND'S "PRODUCTION COST PATROL?"

11.8 Minutes Per Piece... *SAVED!*



Cleveland production engineers recommended a method showing savings of 11.8 minutes per piece on this part *on the equipment already in use*—released two machines for other work.

A BROAD STUDY of plants in all kinds of manufacture shows that unless your organization is outstandingly unusual there is an even chance that *you can be shown how to make substantial savings* in your turning and forming departments.

The Cleveland Automatic Machine Company has developed a service, manned by engineers with special training, through which, without cost to you, a survey can be made, in cooperation with your production staff, that will tell you whether and how such savings can be made. We call it a "Production Cost Patrol" because its purpose is to police wasteful methods. The steps are simple . . .

1. Upon request you will be given details of the engineer's method of surveying your plant. Credentials will be submitted if required by the nature of your work.
2. The engineer will spend as much time as necessary in your plant, making detailed studies without interrupting production or making demands upon your organization.
3. A written report will be made for you, with proposals for changes in method wherever savings can be made.

This service is not limited to users of Cleveland Automatics, nor are the proposals limited to cases where the savings can be made on Clevelands. In many studies made by Cleveland engineers, new methods involving substantial savings have been found for the equipment already in use. In any event there is no charge.

●

May we explain Cleveland's Production Cost Patrol to you more fully?

Cleveland's new product information bulletin is off the press. Describes the complete line of automatics, and Cleveland-made diecasting machines.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND, OHIO

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EXTREME accuracy, tremendous torque capacity and absolute safety are the outstanding features of the Jarvis Quick-Change Chucks and Collets.

In their manufacture exceptional care is taken in the selection of the steel for chuck as well as collet; both are hardened and ground inside and out.

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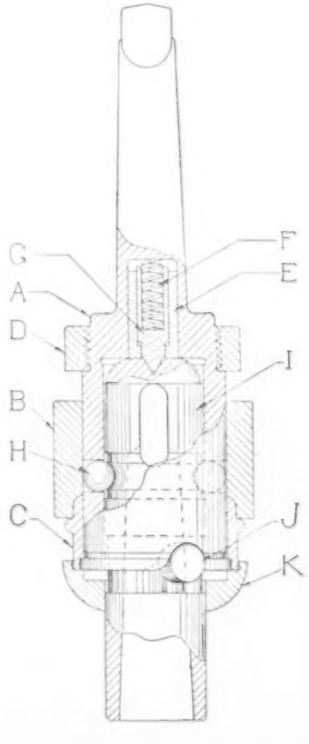


THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

AN EYE FOR PRODUCTION

STANLEY FLUD-LITE MAGNIFIERS

He sees the tiniest cracks, scratches or errors in dimension of machined parts quickly and clearly.

Increase the Eye-Efficiency of Inspectors, Assemblers, Toolmakers, Machinists, and Others Engaged in Close Work

Eyes that are protected from the strain of close work mean more and better production – an important consideration for war-busy plants.

With Stanley "Flud-Lite" Magnifiers on the job, eye-efficiency is assured by (1) floodlighting the work area with glare-free fluorescent light, and (2) magnifying the work through a high quality, 5" diameter lens.

You can add this tremendous advantage to every worker engaged in close-up work. They can see the tiniest flaws and scratches in machined parts quickly and clearly, detect dimension errors instantly, check reamers, gauges, punches, dies, etc., to perfection.

Save man-hours . . . Speed production . . . Write today for Catalog Sheets. Stanley Electric Tool Division, The Stanley Works, New Britain, Connecticut.

1843 STANLEY 1943

No. 701 is the bench type Stanley "Flud-Lite" Magnifier. Equipped with steel base and two friction joint arms which permit adjustment to any desired position. Base is removable to allow permanent attachment to a machine or in any other location.

No. 701H is the portable type Stanley "Flud-Lite" Magnifier. It permits inspection anywhere in the plant, inside machines, and other hard-to-reach places. Fitted with a comfortable grip, hardwood handle, and six feet of approved cable.

FLUORESCENT DAYLIGHT LAMP illuminates every detail of the work with shadow-free brilliance. Operates from any 110-120 volt A.C. outlet.

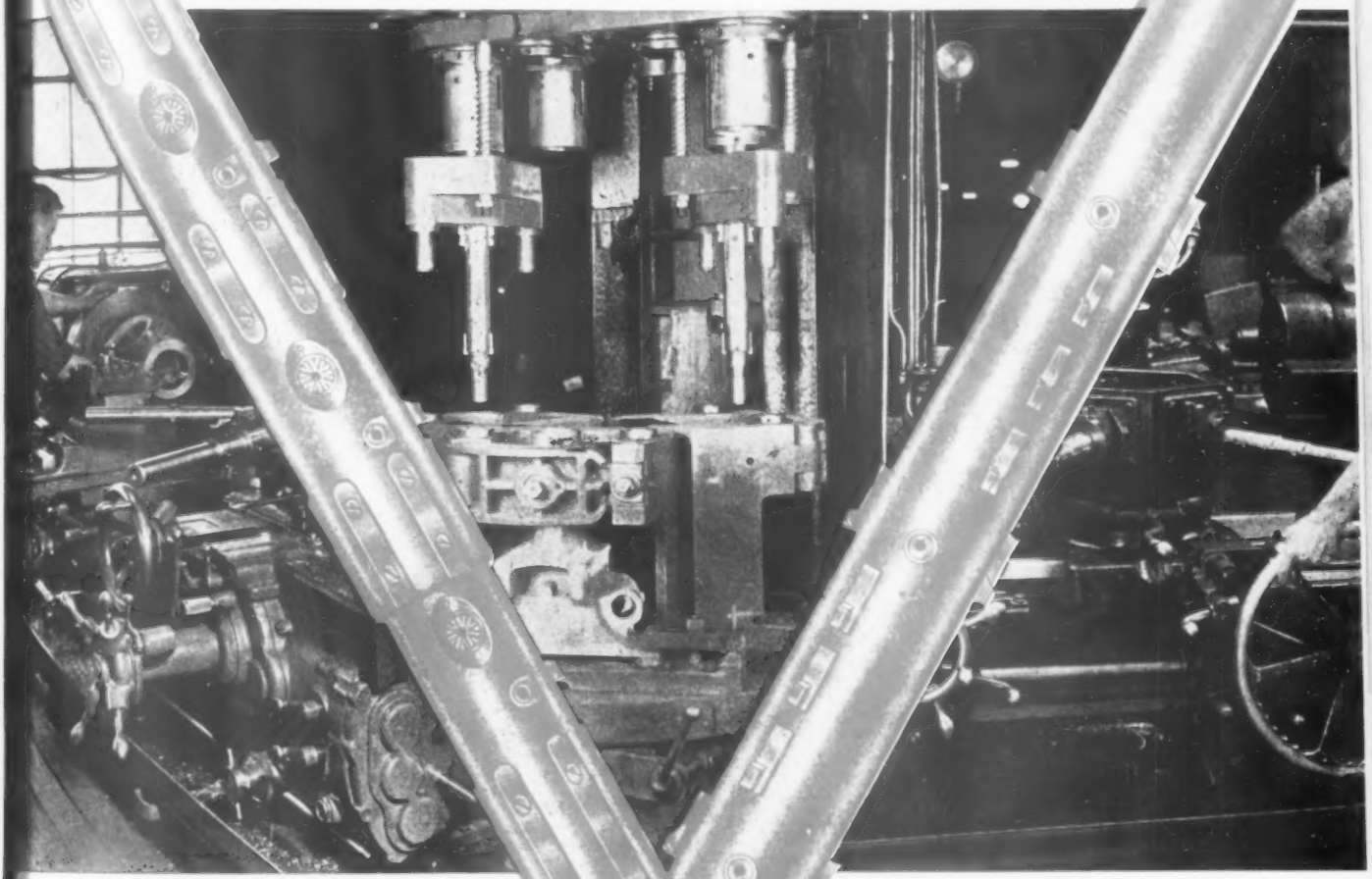
STANLEY ELECTRIC TOOLS

The TOOLS of VICTORY Are In Our Hands

Men and machines, all over America, all working at the very peak—that's what it still takes to produce the ships, planes, tanks, and guns so vital for victory.

DAVIS BORING TOOL DIVISION

LARKIN PACKER CO., INC. • • • ST. LOUIS, U. S. A.



DAVIS

BORING TOOLS

SOMETHING OLD *and* SOMETHING NEW

This is the story of broaching . . . Broaching — the machining operation which has so vastly changed the cost on mass production precision parts . . . Broaching — which is as old as man's search for tools, as new as tomorrow's dreams.

At the turn of the century the demand for mass production precision parts welcomed with open arms the Lapointe invention of the pull principle in broaching and the development of engineered design in broaches and broaching machines. America's mass production dates from this beginning. It was by broaching that the automobile industry and dozens of other producers of consumer goods were able to mass produce interchangeable parts. It is by broaching that aircraft and armament parts are exceeding production schedules. It will be by broaching that thousands of products from safety razors to steam shovels will be made better, quicker and cheaper.

Founded in 1902, The Lapointe Machine Tool Company is the world's oldest and largest manufacturer of Broaches and Broaching Machines.

ARMY E NAVY

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A

Your newest trainee can't forget these "safety goggles" – they're built-in . . .

Extra convenience, efficiency, safety . . . with this

Delta Tool Grinder

You would expect to pay much more — perhaps several times as much—for the features and all-around quality you find in this low-cost Delta machine.

Delta's patented Twin-Lite safety shields minimize the risk to the most inexperienced operator. They increase efficiency and accuracy by flooding the work with light . . . on both sides and face of the wheel . . . at all times, regardless of general lighting conditions in the shop.

This is just one of many features which give you the finest working combination on the market — regardless of price — for all-around industrial grinding. Simple, easily adjusted attachments enable operators to do accurate drill grinding, etc. with a minimum of training.

Safety shields: Double thickness shatter-proof glass. Two lamps wired to motor switch. Wheel guards meet strict safety regulations of Wisconsin Industrial Commission.

Tool rests fully machined, accurate. Fully adjustable, easily detached.

Wheels: Absolutely true and vibrationless for accurate, satisfactory results. Balanced to 1/100-inch ounce.

Size: One-inch face by 7-inch diameter, ⅝-inch hole.

Type: 60N and 46M aluminous oxide.

Bearings: Precision double-sealed New Departure ball bearings — lubricated for life, protected against damage from abrasive dust.

Heavy Base, 14½" x 15½". Tool rests 39" from floor.

Price complete F.O.B. Milwaukee, (depending on type of motor required). $72.00 to $89.50. A-1-A priority required.

Drill Grinding Attachment — with accurate scale for setting to the drill angle you need for the job. Left: Holder for Wheel Dresser (Dresser not included).

See Your Delta Industrial Distributor

He can give you information on this and other low-cost Delta machines—including latest data on priorities, deliveries, etc. (Delta sells only through distributors). Then install one of these efficient machines — for results that are a lasting credit to your good judgment. Mail the coupon for new Delta catalog.

M-5

DELTA
MILWAUKEE
Machine Tools

DRILL PRESSES — GRINDERS — CUT-OFF MACHINES — BAND SAWS — ABRASIVE FINISHING MACHINES

Tear out and mail this coupon today

Bench Model Delta Grinder

Same features as on pedestal model. Price complete (depending on type of motor required) F.O.B. Milwaukee $56 to $65.75.

THE DELTA MANUFACTURING CO.
610M E. Vienna Ave., Milwaukee 1, Wis.

Please send me your new catalog giving full details on the Delta Tool Grinder and your full line of low-cost machine tools.

Name..... Position.....

Company.....

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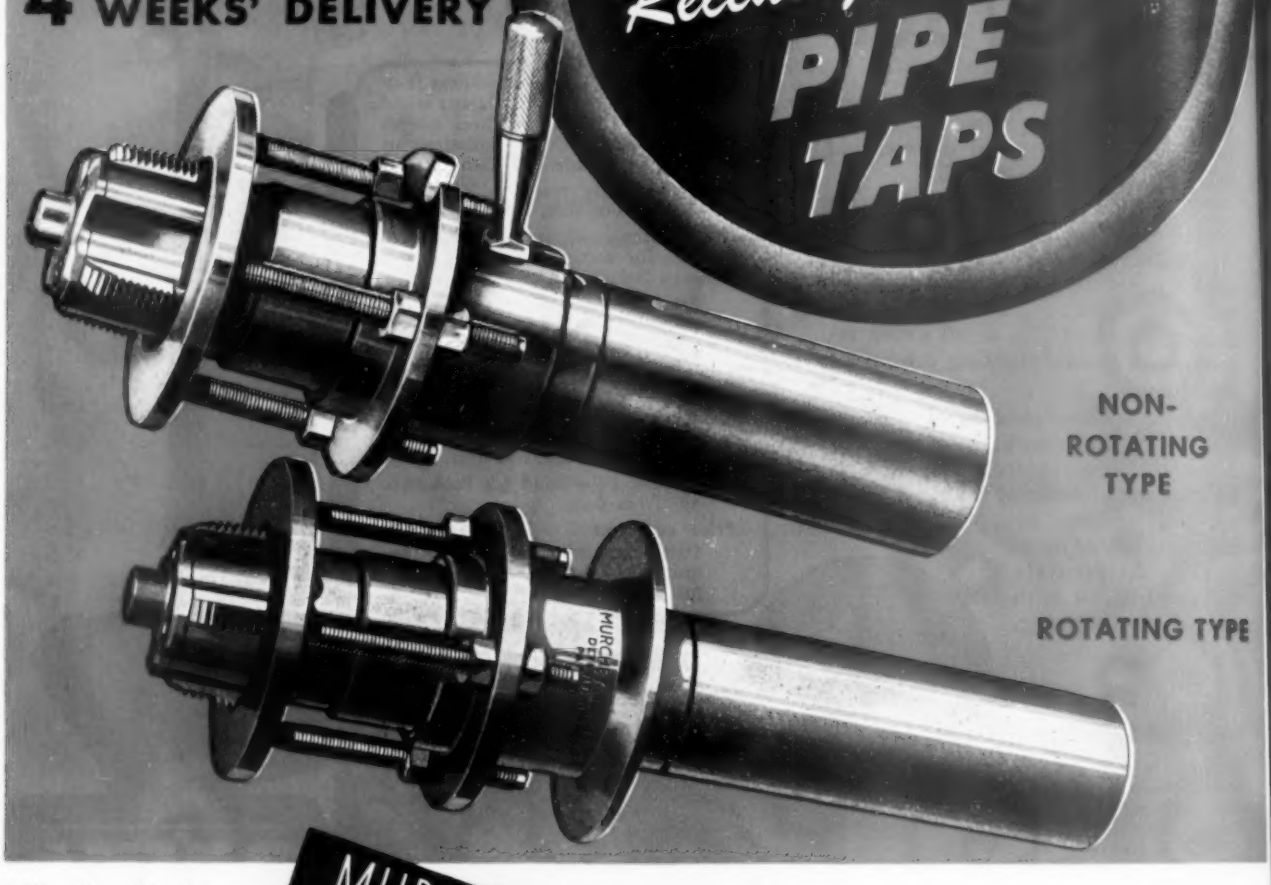
Easy —TO SET
—TO ADJUST
—TO OPERATE

MURCHEY
Receding Collapsible PIPE TAPS

4 WEEKS' DELIVERY



Write for descriptive pamphlet on Murchey's Collapsible Pipe Taps. It's yours without obligation.

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For tapping steel products, you need MURCHEY'S Full Receding Pipe Taps. These Collapsible Pipe Taps are the result of Murchey's years of experience in developing equipment for all types of threading operations. Production men everywhere recognize MURCHEY'S as the foremost products of their kind for simplicity, speed of operation, accuracy and ability to lower production costs.

MURCHEY MACHINE & TOOL CO.
DETROIT 26, MICH.

MURCHEY

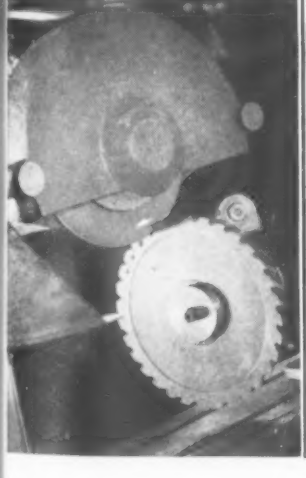
Also manufacturers of all types of Self Opening Die Heads and Collapsible Taps

HERE'S HOW TO DO IT...

and use grinding wheels wisely, too!

TO keep war production up to quota, industry needs tools, lots of them—and lots of grinding wheels to keep them sharp. There's enough steel and abrasives to do the job—but only if every man on a grinding wheel uses the proper procedure in sharpening tools. Otherwise precious steel is wasted, and grinding wheels are used up too fast. Here are a few rules to remember that will help you "treat 'em right."

Every hour this war is shortened will save $12,000,000. The lives it will save are priceless. Let's get it over with — quickly.



Use the correct wheel for the job. It is essential that the correct grain type and size, structure and grade and the proper bond be used. The Carborundum Representative will be glad to help make your selection.

Keep grinding wheels sharp. Dress frequently with the proper dressing tool.

Sharpen tools frequently. Don't wait until they are very dull. You may waste tool steel by taking off too much stock and lose production. Sharpen them after a specific number of cuts—even if they don't seem to need it.

Control tool form. Proper tool performance can only be obtained by maintaining correct rake and clearance.

Use light grinding pressures. You may burn the tools. Edges may become soft from overheating.

Use the right equipment. Use only machines for reconditioning tools which are designed for the job.

CARBORUNDUM
REG. U.S. PAT. OFF.
ABRASIVE PRODUCTS

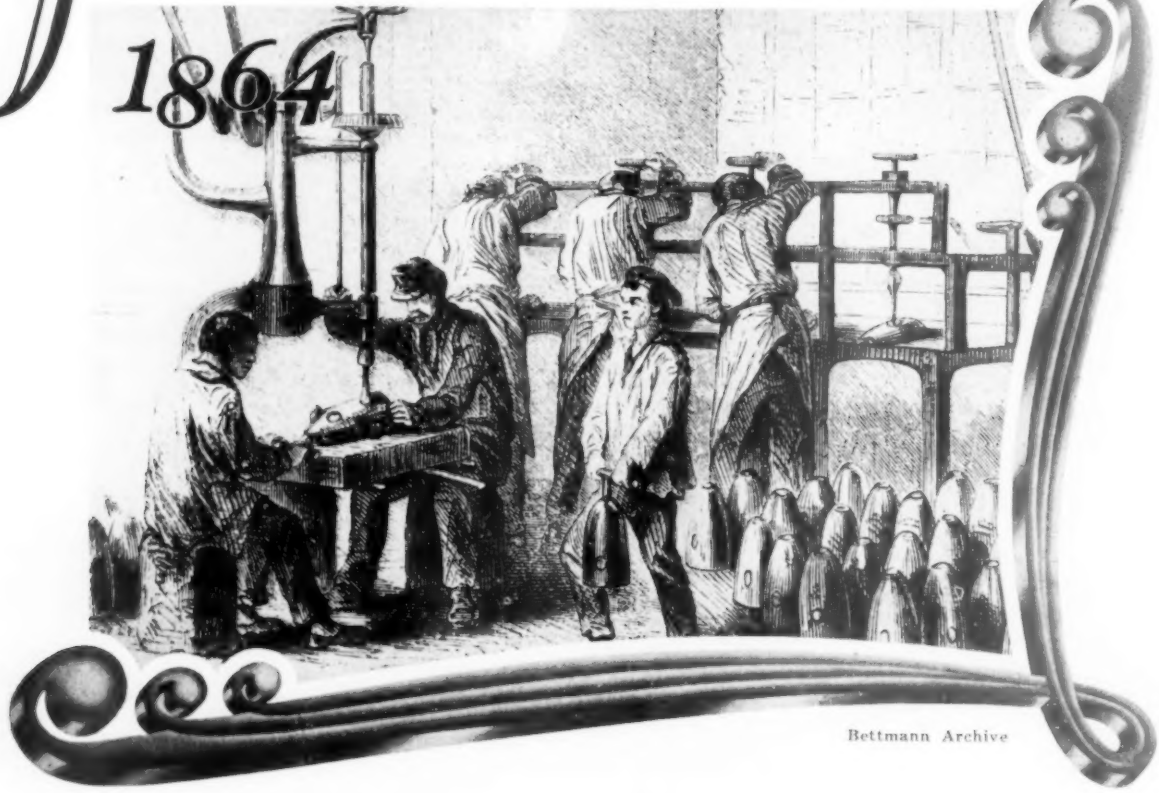
THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)

Just imagine production then



Bettmann Archive

THIS interior factory view is taken from an 1864 woodcut. It is a typical illustration of the armament industry during the Civil War for it shows the methods employed in drilling and shaping grenades. The feeding, chucking and much of the actual work was done by hand. Compared by the standards of today, production was slow, tedious, negligible. And what is the greatest single improvement over those old methods? Perhaps it is the advancement in the use of air and hydraulics . . . the applying of air and hydraulic pressure for the operation of chucks, work holding and ejecting devices, assemblying presses and many other air and hydraulically operated labor-saving devices. "*LOGAN*" Air and Hydraulic Equipment has solved production problems and speeded up manufacturing in most of America's largest industrial plants. Let "*LOGAN*" Engineers make recommendations on modernizing the equipment in your plant by the application of *Air* and *Hydraulic* equipment.

"LOGAN"

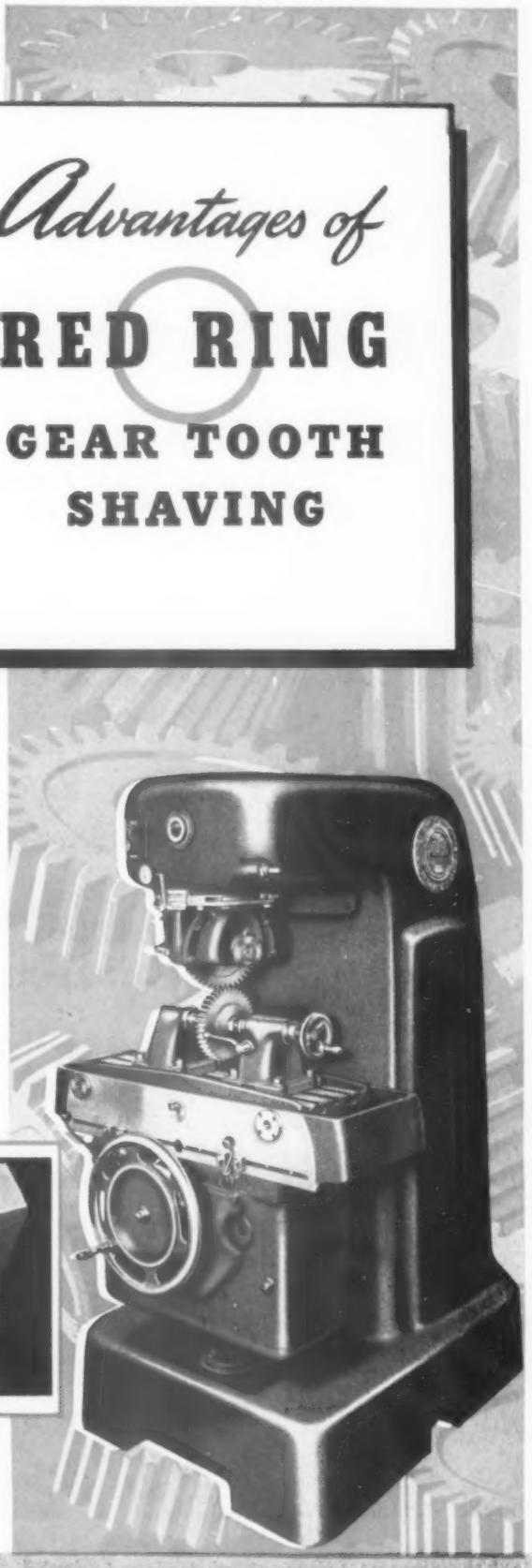
LOGANSPORT MACHINE, INCORPORATED

902 PAYSON ROAD — LOGANSPORT, INDIANA

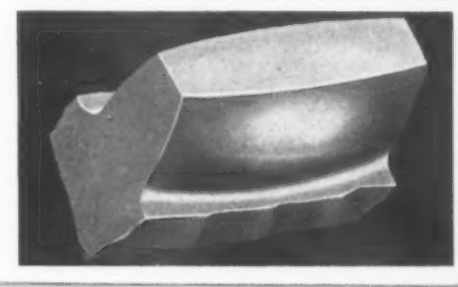
Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories

Advantages of RED RING GEAR TOOTH SHAVING

1. Corrects gear cutting errors of index, helical angle, tooth profile, eccentricity, and tooth roughness.
2. Applicable to spur gears, helical gears, cluster and shoulder gears, and internal gears.
3. Produces a uniform product so that proper allowances may be made for consistent heat treat distortion.
4. Requires only a small fraction of the machining time required by grinding, for the same quality of product.
5. Gears shaved and hardened are free from microscopic cracks in the tooth surfaces such as occur in ground gears.
6. Ground gears must pass a Magnaflux Test in order to discard those having these microscopic cracks which contribute to hazardous failures.
7. Tooth profiles are smooth and free from flats such as produced by some methods of grinding.
8. ELLIPTOID tooth form to eliminate end bearing can be produced at no extra cost.
9. The shaving operation is fully automatic; consequently, no skilled operators are needed.
10. Materially reduces gear noise and improves gear operation.
11. Produces uniformly high quality gears with a minimum of supervision.



MACHINES AVAILABLE FOR GEARS ¼" P.D. TO 96" P.D.

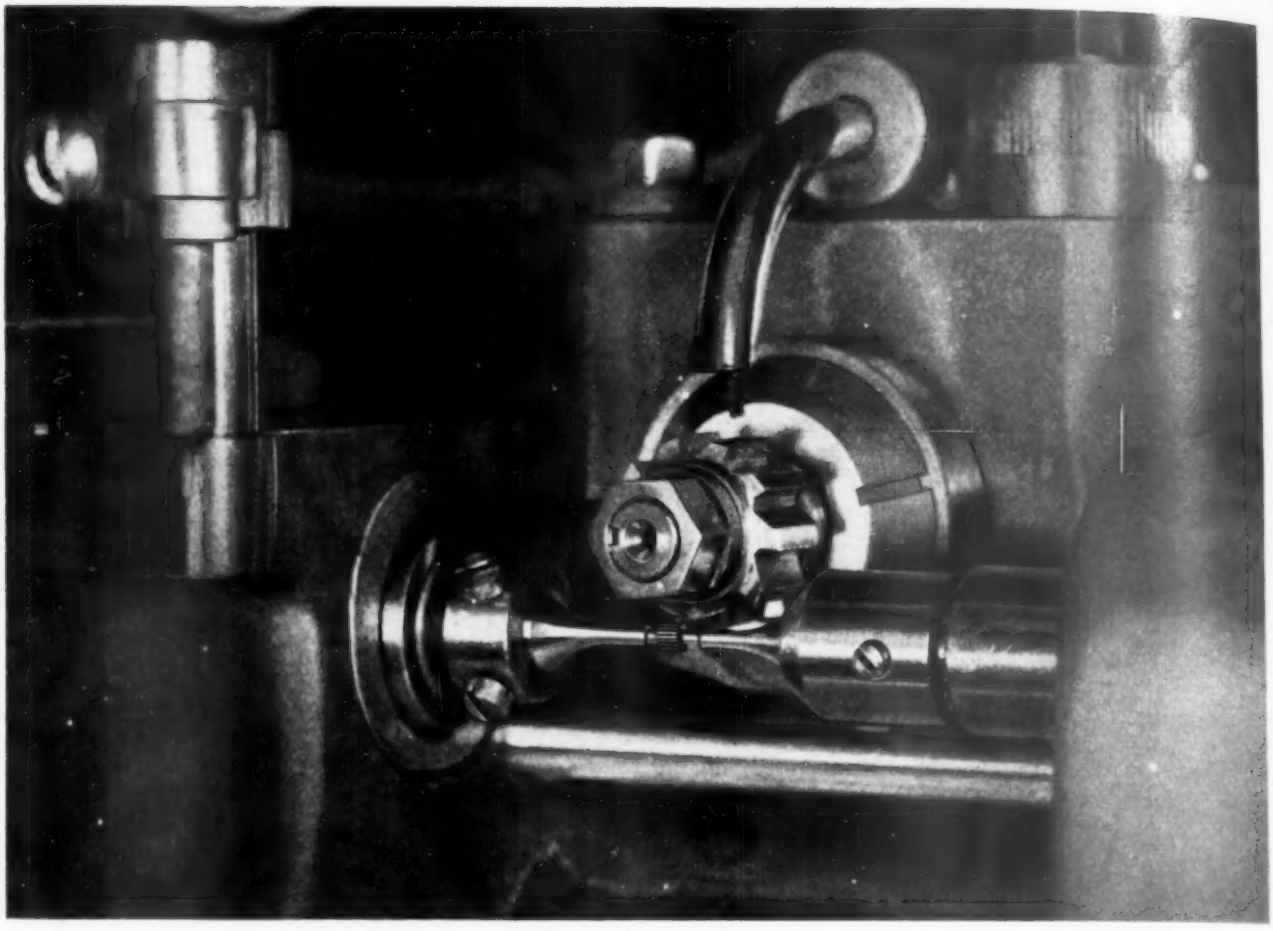


Send for descriptive bulletin on RED RING Crossed Axes Rotary Gear Shaving.

NATIONAL BROACH AND MACHINE CO.
RED RING PRODUCTS
5600 ST. JEAN · DETROIT, MICH.

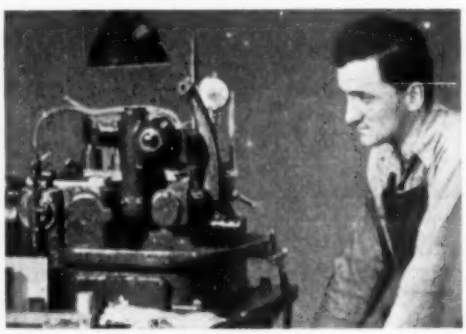
SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS



THIS TINY GEAR HELD WITHIN .0003" ON P. D. WITH BARBER-COLMAN TYPE "S" HOBBING MACHINE

CONSIDER a gear only .111″ in outside diameter and with a face width of .086″, having 18 teeth of 180 diametral pitch — how would *you* go about cutting those teeth? Then consider that the accuracy requirements called for *not over .0003″ error* on the pitch diameter when measured over wires .1133″ — how would *you* consistently maintain that precision? Finally, consider that the specifications called for "very fine finish"— how would *you* obtain it? . . . This customer found the answer in a Barber - Colman Type "S" Hobbing Machine. A tenth indicator was added to the machine to gauge the extreme accuracy needed for positioning. The Type "S" Machine is designed for hobbing spur gears and pinions less than 1″ diameter and ½″ face. For production jobs, the Type "S" is fitted with a magazine feed, which, with the complete cam-controlled cycle, makes it a *fully automatic* machine requiring only the loading of the magazine. For complete details call your nearest Barber-Colman representative.



WRITE FOR CIRCULAR

The remarkable achievements in manufacture of small gear-cutting tools are summarized in our Circular F-1976 "Fine-Pitch Hobs." Write for a copy and learn what can *now* be done to put small gears on a precision-production basis.

Buy War Bonds

BARBER B-C COLMAN PRODUCTS: HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 213 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

14½" SOUTH BEND
TOOLROOM LATHE
SPECIFICATIONS
Swing over bed . . . . . 14⅝"
Hole through spindle . . . . . 1⅛"
Maximum collet capacity . . . . . ¾"
Thread cutting feeds (48) . . . . . 4 to 224 per inch
Spindle speeds 8
Power longitudinal and cross feeds . 48

SOUTH BEND TOOLROOM LATHES

for Precision Machine Work

TRAINING HELPS

Sound films, books, wall charts, and bulletins are available for training lathe operators. Write for a copy of Bulletin 21-C.

Skilled craftsmanship combined with excellent design in South Bend Toolroom Lathes make them highly efficient for machining work to precision limits.

Their accuracy, speed, and smooth power assure fine finishes. Wide ranges of turning and facing power feeds, thread cutting feeds, and spindle speeds, plus ease of operation, help to simplify the exacting jobs.

South Bend Toolroom Lathes and Engine Lathes are made with 9″, 10″, 13″, 14½″, and 16″ swings. South Bend Precision Turret Lathes are made with 9″ and 10″ swings. Write for a copy of Catalog 100-C.

ARMY-NAVY

SOUTH BEND LATHE WORKS

SOUTH BEND 22, INDIANA — LATHE BUILDERS FOR 37 YEARS

A NEW AND IMPROVED LINE OF WELDING POSITIONERS WITH *Dual Capacity*

Easier to operate! ☆ They simplify positioning of work. ☆ Enable operators to increase arc time . . . to do more welding. Offered in a wide range of dual capacities. ☆ Let them help you increase production and lower your welding costs. ☆ *Write today for descriptive literature.*

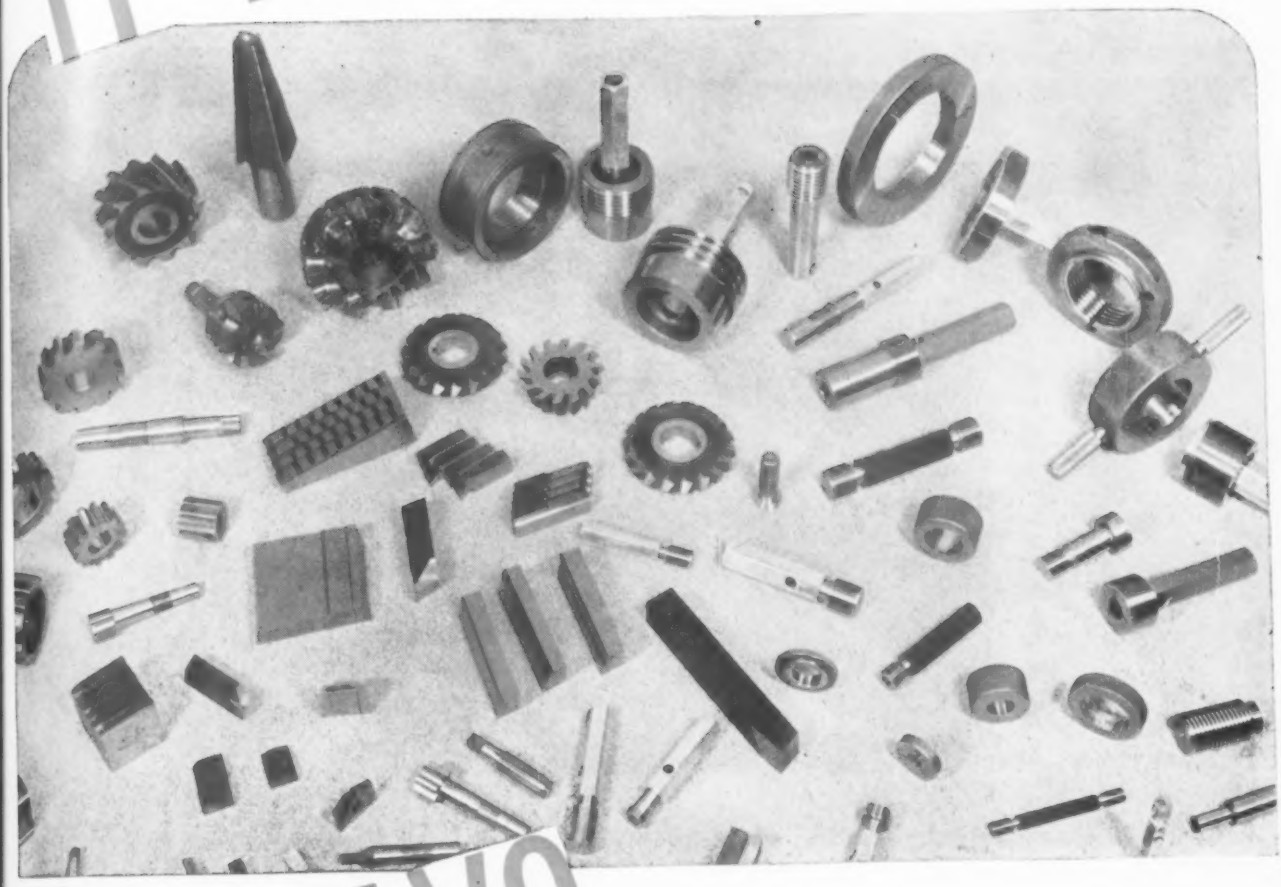
4610 WEST NATIONAL AVENUE
MILWAUKEE 14, WISCONSIN

HARNISCHFEGER
CORPORATION
ARC WELDERS · EXCAVATORS · ELECTRIC CRANES · P&H · MOTORS · HOISTS · WELDING ELECTRODES

● **P&H is America's only manufacturer providing a complete welding service including AC and DC welding machines, electrodes, production welding control systems, welding positioners, and "Thru-the-Air" materials handling equipment**

Canadian Distribution: The Canadian Fairbanks-Morse Co., Ltd.

IT PAYS to buy Good Tools



IT PAYS to take care of Good Tools

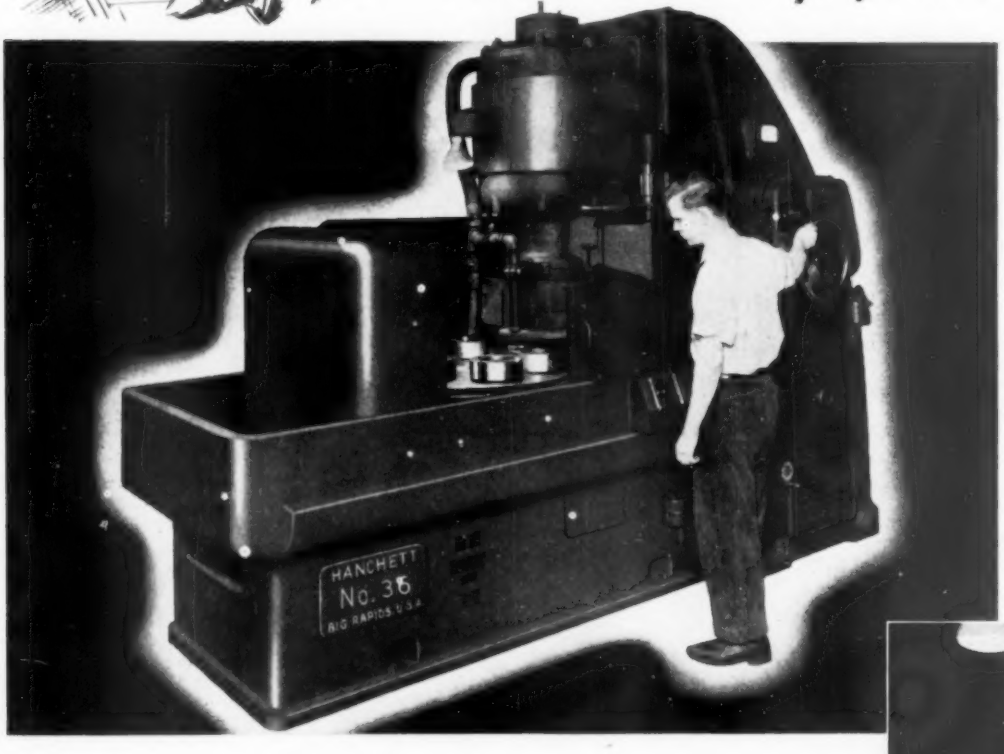
The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS

Select the Method—

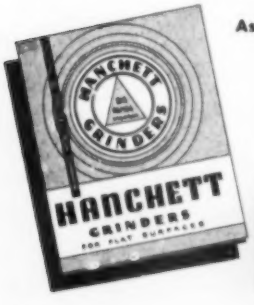
THEN THE MACHINE

HANCHETT ENGINEERING SERVICE WILL HELP YOU SOLVE THOSE *Tough* GRINDING PROBLEMS



These views illustrate a typical set-up of heat-treated steel forgings being ground on a No. 36 HANCHETT Rotary Table Surface Grinder. Here, .020 stock is removed from both ends to limits of plus or minus .001, and square within .001 across the diameter.

HOW best to surface grind YOUR jobs? . . . On rotary or reciprocating table — with vertical or horizontal spindle — traveling wheel — single or multi-spindle type? To assure lasting satisfaction, FIRST select the grinding METHOD that will produce the desired results with the highest efficiency. THEN enlist Hanchett's engineering service in determining just the right *machine* for your specific purpose. The surface grinder you select may well bear the HANCHETT nameplate — because Hanchett makes ALL types and is therefore able to offer unprejudiced advice that might prove profitable to you.



Ask for Catalog No. 170T-1

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.

BIG RAPIDS, MICHIGAN U.S.A.

FIRTHITE
SINTERED CARBIDES
FOR UNIFORM PRECISION
WAR'S "appetite" for interchangeable parts knows no bounds. Since interchangeability depends upon **uniform precision,** tools must **stay** sharp on long runs or long cuts.—That's where FIRTHITE Sintered-Carbide Cutting Tools excel. Their near-diamond hardness maintains **uniform precision** in mass production and on hard materials.
ARMY NAVY
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STEEL COMPANY
Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA
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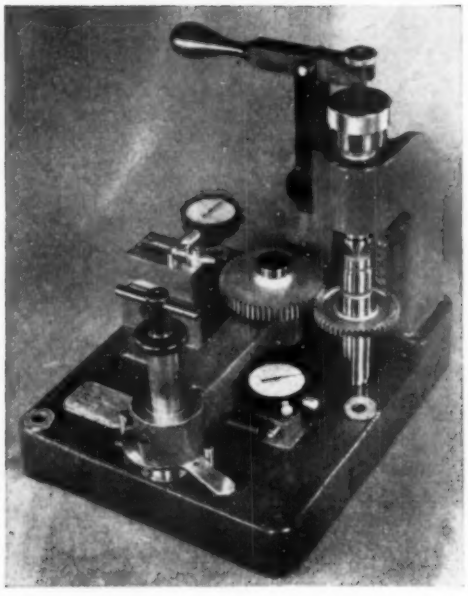

Almost everything that moves, uses

GEARS

Tanks rolling from invasion barges—jeeps dashing and bouncing up the beaches—planes covering the attack from above—more barges, filled with our warriors, speeding toward the shore—mounted guns blazing destruction to the enemy—these and many more of the Victory-producing products made in America for the United Nations, rely upon GEARS for the success of their motive power. Not just gears, but gears made as nearly perfect as human skill and precision machinery can produce. For the checking of production gears, VINCO has made, during the past quarter century, precision master gears and gear rolling fixtures. These examples of VINCO quality represent the ultimate in the art of precision manufacture.

Millionths of an inch for sale by

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HEAD OFFICE:
DETROIT, MICH.

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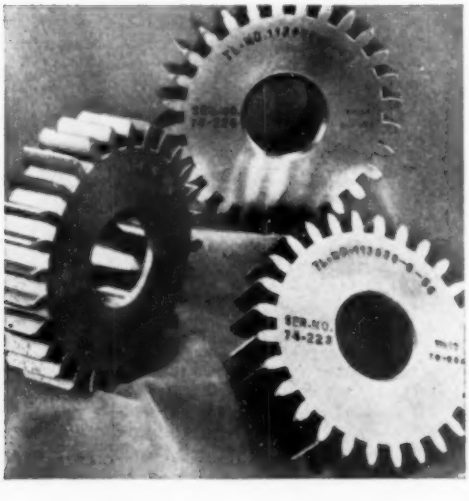
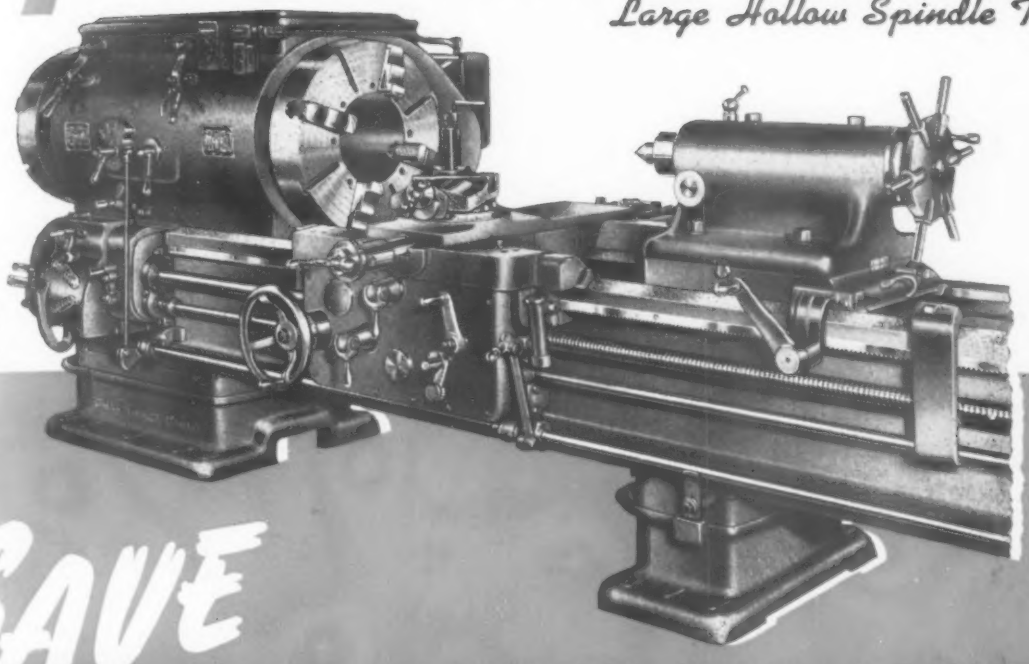


Hydratrol Lathes

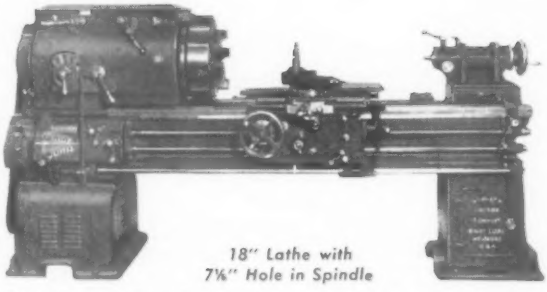
Large Hollow Spindle Type



30" Heavy Duty Lathe with 13" Hole in Spindle

SAVE 15,000 MAN HOURS PER MONTH IN ONE WAR PLANT!

Perform Important Operations in 1/7th the Time of Previous Practice



18" Lathe with 7¼" Hole in Spindle

SIZES from 18" to 36"

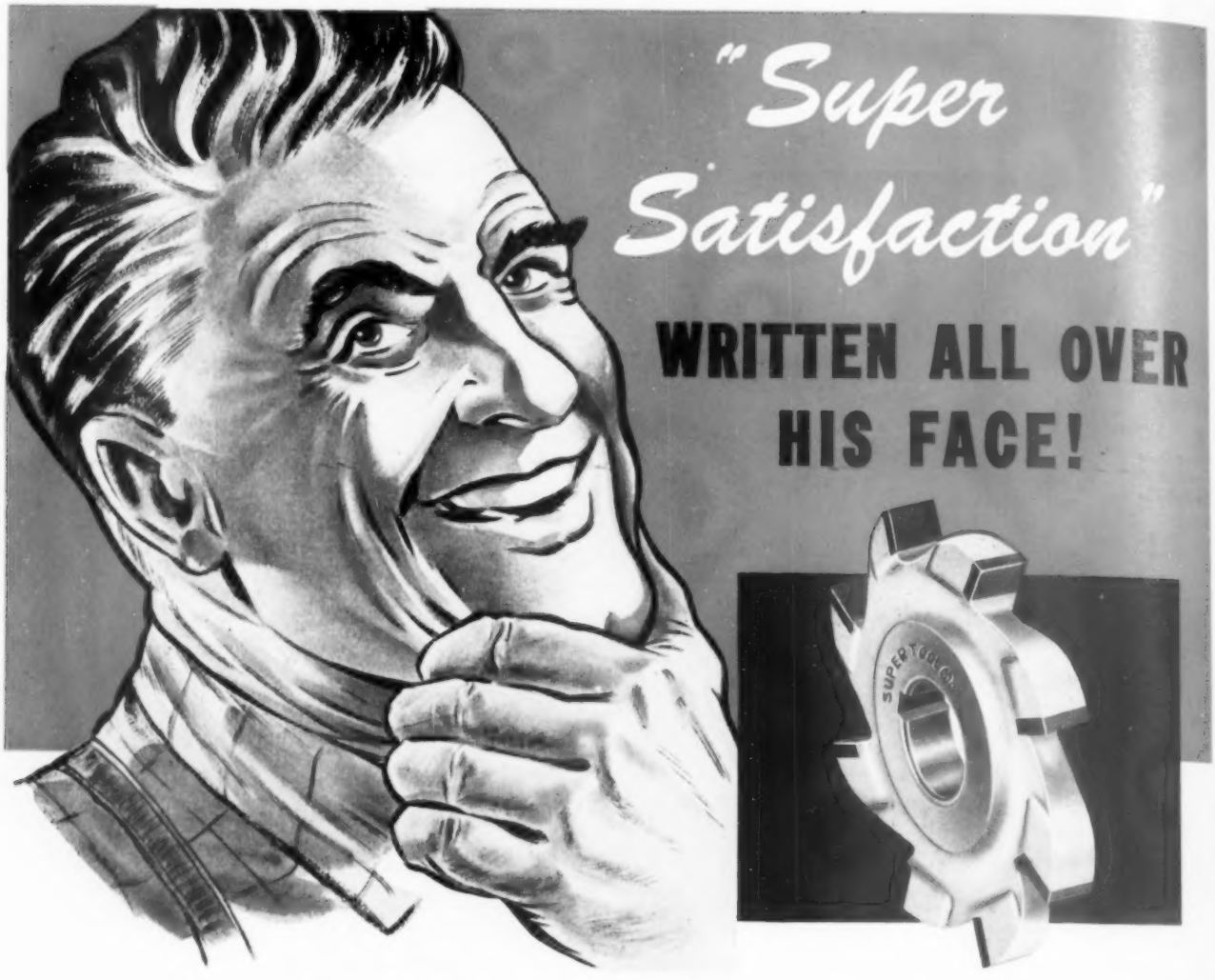
SMALL—18"	**. . . . .**	**Up to 7¼" Hole**
MEDIUM—24"	**. . . .**	**Up to 12" Hole**
LARGE—27"	**. . . . .**	**Up to 13" Hole**
LARGE—30"	**. . . . .**	**Up to 14" Hole**
LARGE—36"	**. . . . .**	**Up to 16½" Hole**

8 Distinctive Features

- ★ Easy, Fast, Simple Operation.
- ★ Hydraulic Brakes and Clutches.
- ★ Absence of Mechanical Troubles.
- ★ Essential Operating Information Automatically Presented (on all Standard Models).
- ★ Automatic and Ample Lubrication.
- ★ Mechanism Protected by Automatic Control.
- ★ Extraordinary Hardness of Bed.
- ★ Available with Large Turrets for carriage which fully utilize the Great Power Capacity of these machines; and Beds on both ends of Headstock.

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND ★ SAINT LOUIS (3) MISSOURI



OTHER SUPER CARBIDE TIPPED TOOLS *FOR*

Turning, Facing, Reaming, Spotfacing, Forming, Grinder Rests, Wear Parts, Boring, Drilling, Grooving, Counterboring, Shaving, Centers and Special Purposes.

Of course he's satisfied! Like most production men who use Super Carboloy-Tipped Milling Cutters, he is getting faster, more accurate and more economical milling production. He is typical of users throughout the country who report such amazing production records as these . . . "With Super Milling Cutters we decreased the cutting time on one job 200%," "On a bronze alloy job we increased the number of pieces per grind 700%," "On a steel milling job we now complete a standard run in 2 hours that formerly took 8 hours."

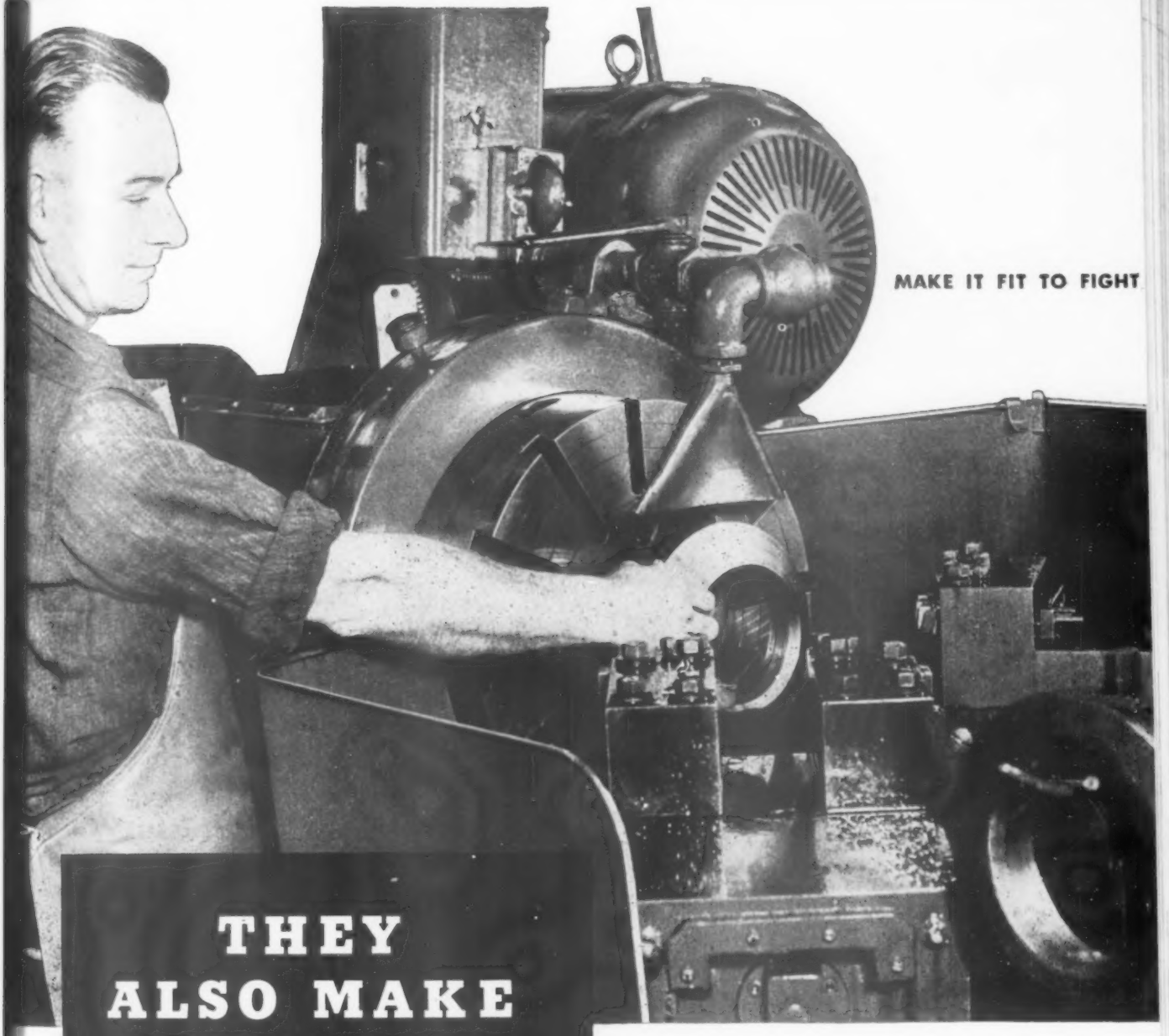
Other users of Super Carboloy-Tipped Milling Cutters will tell you that in cast iron and nonferrous materials they can run at machine capacity with feeds of .002″ to .005″ per tooth. In steel with tooth loads of .0005″ to .0025″ they can run at surface speeds of 400 to 800 feet per minute. That's performance you shouldn't overlook in times like these!

Why not learn more of the advantages of these milling cutters that are establishing new records in speed, accuracy and economy on all types of milling operations. Let us send you a descriptive folder.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California



MAKE IT FIT TO FIGHT

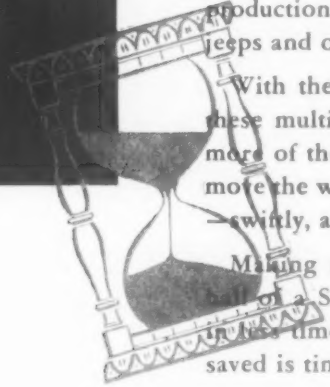
THEY ALSO MAKE *Time*

GISHOLT

GISHOLT SIMPLIMATICS provide the extremely high speed essential in the mass production of parts for planes, tanks, trucks, jeeps and other vital war equipment.

With their automatic machining cycles, these multiple-cutting lathes require little more of the operator than to load and remove the work. The machine does the rest —swiftly, accurately.

Making a wide variety of parts is only half of a Simplimatic's job. Making them in less time is the other. For in war, time saved is time earned.



GISHOLT MACHINE COMPANY

1219 *East Washington Avenue* • *Madison, Wisconsin*

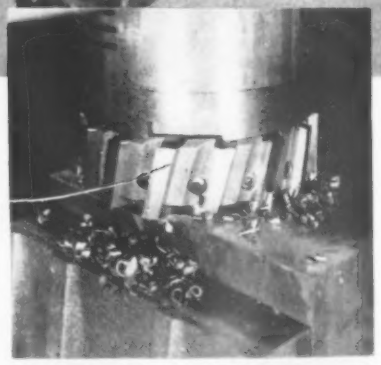
Look Ahead... Keep Ahead... With Gisholt Improvements in Metal Turning

Your machines are only as good as their cutters

YOUR machine, regardless of how well designed and equipped in other appointments, gives the best performance only when operated with cutting tools designed for the job.

As a natural consequence of meeting and solving many machine problems in milling, Ingersoll has developed a line of milling cutters in types and sizes to suit the conditions of the work. These include cutters for face-milling, end milling, side milling, slotting, channeling, slabbing, form-milling, and many types of boring. If you are not entirely satisfied with the performance of your machines, investigate their tooling. One example of how you may benefit is described at the bottom of this page.

In stating the conditions of your work give (1) Kind of material being cut. (2) Width and depth of stock removal. (3) Nature of cut, such as face-milling, slotting, etc. (4) Type of machine drive. (5) And if convenient, a sketch of the work-piece.



THE same machine was used in both steel milling cuts shown at the right. The Shear Clear cutter (lower right), designed for jobs of this type, removed twice the amount of stock in less than half the time. The Shear Clear consumed less power and produced a smoother finish. Are you using the proper cutters in your shop?

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILL

SAVE VITAL HOURS IN DELIVERY

This war demands speedy action. Universal's special process of manufacturing Abrasive Wheels and Stones meets this demand . . . with guaranteed 10-day delivery speed.

Your work demands perfection . . . for speed without efficiency is costly time lost. Our exclusive *controlled trial plan* of engineering insures jewel-like perfection—quality without a flaw.

NUBON ***Wheels are used today*** by leading American war plants to meet their most exacting war production specifications. We can also help you solve your toughest grinding problems.

Send at once for your copy of our new catalog

UNIVERSAL WHEEL & ABRASIVE CORP.

2626 West Van Buren Street, Chicago 12, Illinois

NUBON 24 HOUR PROCESS GRINDING WHEELS AND STONES

...THE RIGHT CYLINDER FOR EFFICIENT POWER MOVEMENT

More and more today... engineers and shop men are finding new ways to simplify mechanical movements and improve efficiency... by using T-J Air and Hydraulic Cylinders! This assures getting the *utmost useful work done*... with *minimum* loss of pressure due to friction.

These Cylinders are skillfully designed to deliver maximum power movement in every stroke... dependably... with long life. The mounting surfaces are parallel with (or at right angles to) the bore of the cylinder. All surfaces are strictly inspected for squareness and smoothness. All mounting holes are drilled—not just cored. T-J Cylinders are available in many sizes and styles... write for latest catalogs. The Tomkins-Johnson Co., Jackson, Michigan.

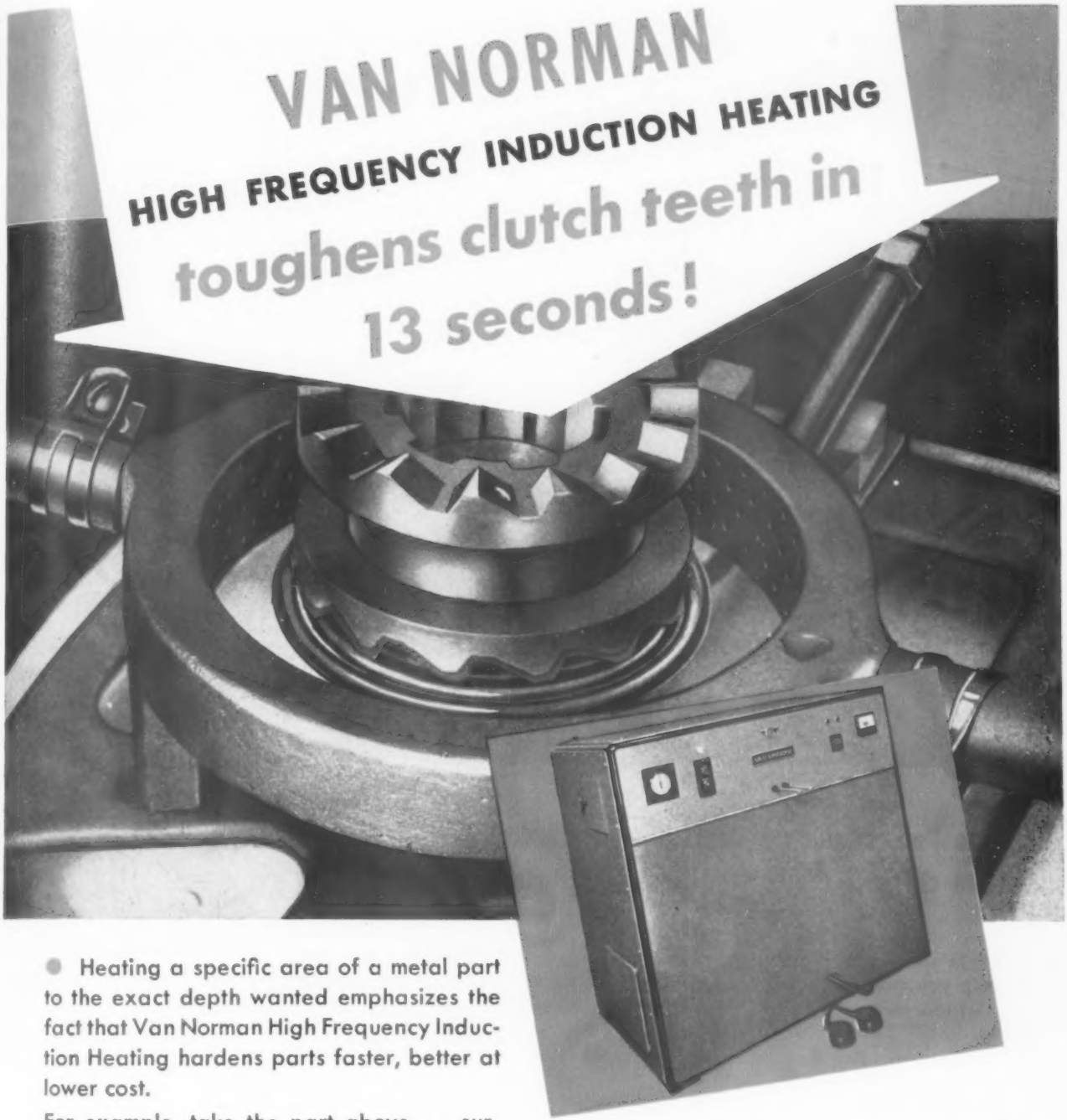
FOR TOUGH JOBS... SPECIFY T-J

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

VAN NORMAN

HIGH FREQUENCY INDUCTION HEATING toughens clutch teeth in 13 seconds!



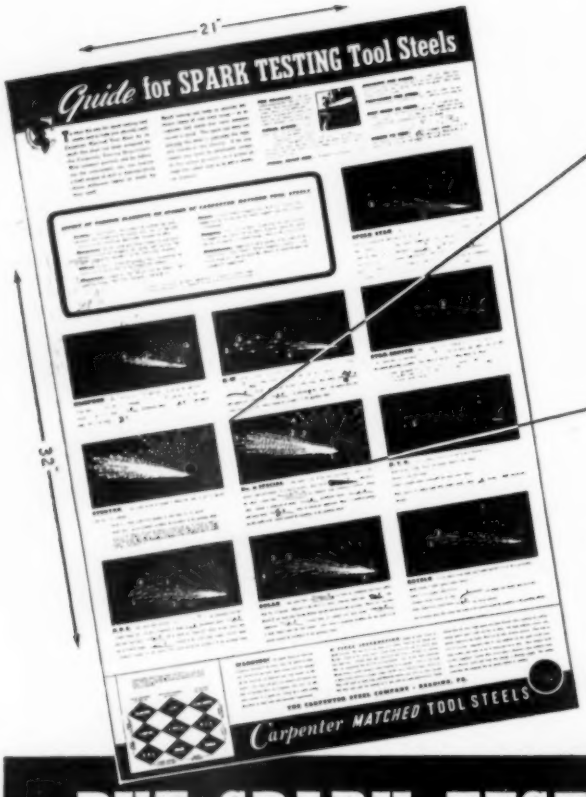
● Heating a specific area of a metal part to the exact depth wanted emphasizes the fact that Van Norman High Frequency Induction Heating hardens parts faster, better at lower cost.

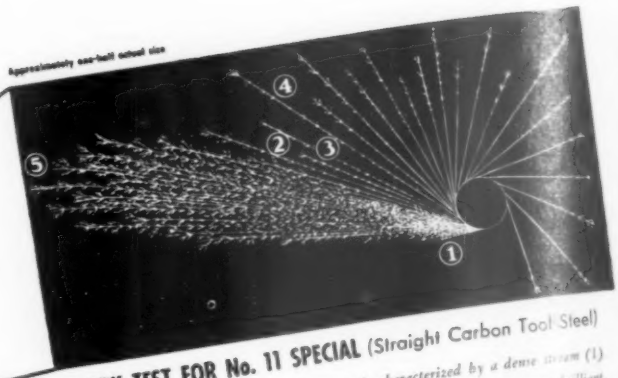
For example, take the part above . . . surface hardening clutch teeth. Van Norman Induction Heating hardens the teeth to 58 Rockwell C, to a depth of $^{3}/_{64}$″ in 13 seconds . . . at a current cost of only 1 cent. Note how uniformly the heating pattern, as revealed by the tooth surfaces, closely follows the contour of the clutch teeth. Cleaning operations are eliminated and each finished part is identical.

Get the story on *Van Normanizing*, today. Find out how Van Norman High Frequency Induction Heating speeds output and lowers cost in Hardening, Brazing, Soldering, Annealing, and other heating applications.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS





SPARK TEST FOR No. 11 SPECIAL (Straight Carbon Tool Steel)

This spark stream is full and brilliant. It is characterized by a dense stream (1) adjacent to the wheel. Carrier lines (2) are relatively long, continuous, brilliant, almost white. Stream is composed of sprigs (3), preliminary bursts (4) and main bursts (5)—none of them suppressed. There is a marked tendency for the spark to be carried around the periphery of the wheel.

Put this Useful Spark Testing Guide to Work Today!

PUT SPARK TESTING TO WORK IN YOUR PLANT...

- **to "unscramble" mixed tool steel stocks**
- **to check the identity of tool steel before hardening tools**

If, in spite of all your precautions, stock mix-ups do occur, *Spark Testing* can help you quickly identify an unknown piece of tool steel.

And this method is often used to check the identity of tool steel before tools are hardened. Thus, it helps to insure correct heat treatment on each job.

By simply holding the steel against an emery wheel and watching the colors of the lines and bursts of the spark stream, you get a quick indication of the major elements present. For example, the Carpenter "Guide for Spark Testing Tool Steels" describes the spark patterns caused by major elements such as carbon, tungsten, molybdenum, etc.

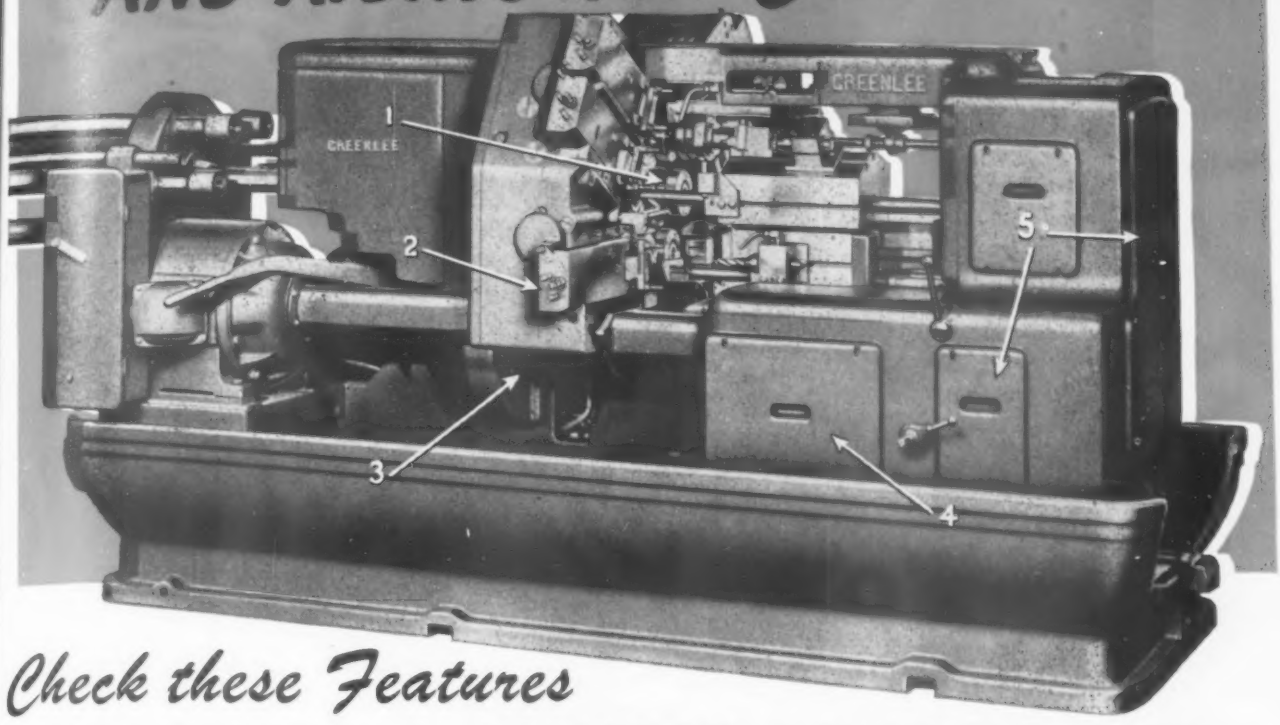
This convenient wall chart was prepared by our own testing department, and is designed to assist your men in getting started on *Spark Testing*. It even contains instructions for *Spark Testing* procedure-grinding wheel speeds, etc. With this chart as a guide, the study of *Spark Testing* is greatly simplified and your men can easily become familiar with this method of steel identification.

For your copy of the Carpenter "Guide for Spark Testing Tool Steels", drop us a note on your company letterhead. We'll be glad to give you a copy.

THE CARPENTER STEEL COMPANY
122 W. Bern Street, Reading, Pennsylvania

Carpenter MATCHED TOOL STEELS

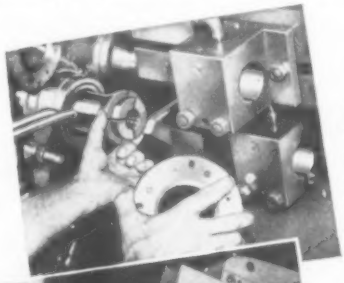
SAVING TIME FOR SET-UP MEN - AND AIDING NEW OPERATORS



Check these Features

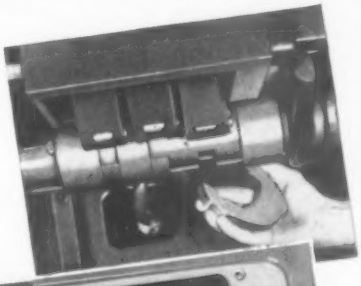
GREENLEE 6-SPINDLE AUTOMATICS

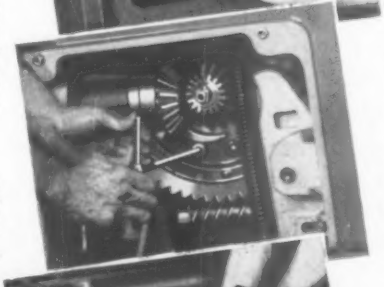
Advantages of accuracy and 6-spindle speed, plus adaptability of machine to efficient war or peacetime production problems, are important factors in the popularity of Greenlee Automatics. The wide-open tooling area and simple adjustments are important time savers for set-up men — important, too, in today's training program for new operators.



1 ***Collet feature promotes accuracy and saves time*** ... collets close positively on bar fed out to stock-stop. There's no endwise movement of collets, none transmitted to stock, promoting accuracy in length of piece.

2 ***Cross-Slide tool adjustments quick and easy*** ... rigid forged-steel cross-slides have identical tool-cavities. Precision adjustments are simple ... easy to understand. The three fine - thread screws move tool holder in desired direction.





3 ***Simple Cross-Slide camming*** ... cross-slides operate independently, permit better tooling set-ups ... increase production. Cams are interchangeable and eliminate special camming for each job.

4 ***No camming required on Main Tool Slide*** ... adjustments are made in jiffy. Adjustable dog on a graduated worm wheel provides exact settings for tool slide stroke. Scales on tool slide help check stroke.

5 ***Speeds and feeds for production and economy*** ... multi-splined pick-off gears provide wide range of speeds and feeds. Machine, with 1⅝" capacity, has spindle speed range from 105 to 2625 R. P. M. and feed range of .0017 to .0388 per spindle revolution.

GREENLEE BROS. & CO.
1951 MASON AVENUE, ROCKFORD, ILLINOIS

GREENLEE *Automatic Screw Machines*

THE ANSWERS TO QUESTIONS LIKE THESE:

What is "Gear-Shaving"?

How does it work?
How accurate is it?
How does it compare with other methods?

Where Can It Be Used?

What kind of gears can be shaved?
Who is using "gear-shaving" today?
How many machine types and sizes are there?
How big a gear can be finished by "shaving"?
How small a gear can be finished by "shaving"?

What About Cost?

How many different gear sizes and types can be finished on one machine?
When should a rack or a rotary machine be used?
What tool life can be expected?
What does it cost to shave gears?

How Do You Use It?

How do you set up to shave different gear types?

What controls gear accuracy in "gear-shaving"?

What machine type should be used for any given class of gears?

How does it affect gear design?

How does the use of "gear-shaving" affect preliminary gear cutting operations?

What About Curve Shaving?

When should "curve shaving" be used?

When should "curve shaving" not be used?

These and numerous other questions are answered in a new booklet just made available by Gear Production Headquarters. Write for a copy on your company letterhead. Ask for Manual No. GF-43.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD . . . DETROIT, U. S. A.

BUY U.S. BONDS STAMPS

How cutting oils and coolants can help*

SUBSTITUTE METALS for scarce alloy tools may help provide enough tools to "go around" in war-busy plants. There is no substitute for tool care to make these tools last long enough to finish the job.

WPB's nine rules for tool care are all important. Point six, particularly—"Keep Tools Lubricated and Cooled—nothing will damage tools more quickly than operation without proper lubrication and cooling."

It is not enough to select cutting fluids that merely prevent tools from burning or tearing the work. The right coolant and proper application can add hours between tool changes, save excessive grinding and loss of tool stock, and give better finish and accuracy. These simple suggestions may help you give your tools a longer and more productive life.

1. Select the right cutting fluid. There is no simple formula for selecting the best cutting fluid for a particular job. The requirements for each job must be carefully analyzed as to the type of tool used—metals to be machined—cutting feeds and speeds—finish and accuracy required. With all of these facts, and a complete knowledge of cutting oil qualities, the cutting fluid requirements on any job can be determined without a great deal of trial and error.

You can eliminate the errors and many trials by discussing your problems with one of our Cutting Oil Specialists. His experience in other plants with similar problems will save making many experiments. His knowledge of products recently developed for these new problems will be invaluable.

2. Apply it in the right places. What cutting fluid you use is no more important than where and how it is applied. Flooding the tool and work is important for cooling action. There must also be a sufficient volume of fluid to reach the point of contact of tool and work. Operators should be cautioned to return the coolant stream to the most effective position after changing tools or work.

3. Keep it clean. Cutting fluids are subjected to considerable contamination. Metal particles should be removed at regular intervals by cleaning out the machine, or by filtering or centrifuging the oil. Coolant lines should be kept free from deposits by using soluble oils which form stable emulsions. Oils are available which do not become rancid or develop strong objectionable odors. Make this an important consideration in selecting cutting oils.

A Standard Cutting Oil Specialist will have many more suggestions for helping you conserve tools through the use of better cutting oils and coolants. Call any Standard Oil Company (Indiana) office, or write 910 S. Michigan Ave., Chicago 5, Illinois, for this service. In Nebraska, call any Standard Oil Company of Nebraska office.

WPB's Nine rules of tool care

1. Put your tools away. Tools are weapons; they must be kept sharp.

2. Change bits *before* they get too dull. You can work faster, better with a sharp tool.

3. Keep rocker rest flat with shims. Your tool point takes a better bite when the tool rest is flat.

4. Put blocks close—clamp work tight. If blocks are too far apart, work is springy, may snap drill. If clamps are loose, work may turn and hurt you.

5. Look out for point of drill. Adjust tool stop so point won't be damaged by the harder backing plate. Don't let drill point hit table when removing.

6. Keep tools lubricated and cooled. Nothing will damage tools more quickly than operation without proper lubrication and cooling.

7. Fit cutter snugly and evenly on arbor. If you force or pound the cutter on, it won't run true.

8. Keep yokes close to cutter. Otherwise you will get chatter and runout.

9. Keep spacing collars clean and parallel. Drunk milling cutters wobble, causing runout.

Oil is Ammunition... Use it Wisely

Standard Oil
CUTTING OILS and COOLANTS

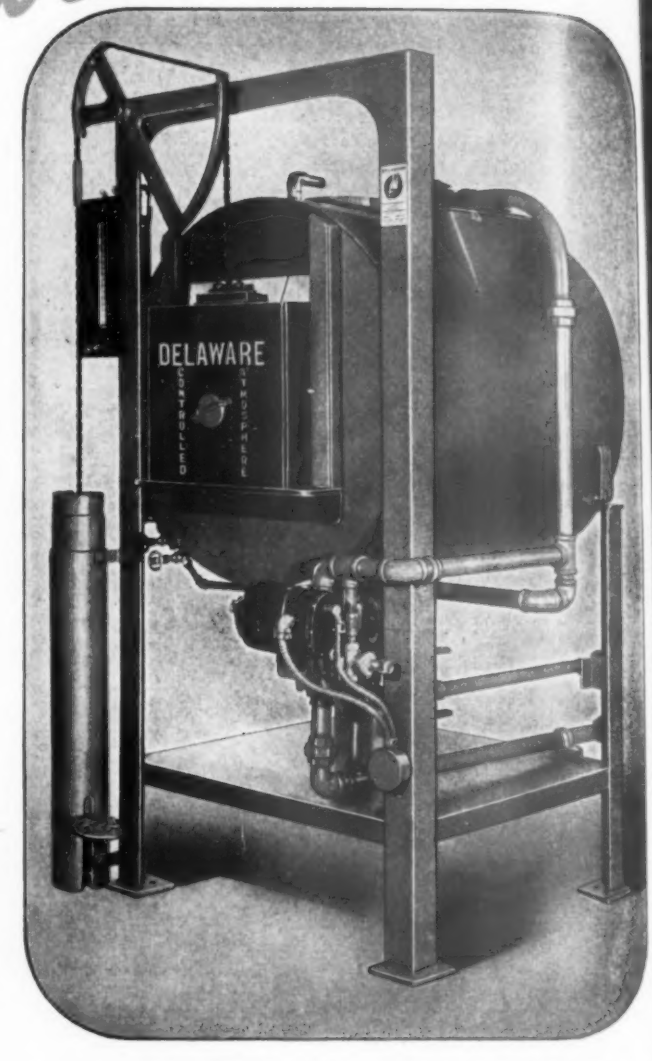
STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

• • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICA

17 Superior Features

IN A DELAWARE CONTROLLED ATMOSPHERE FURNACE

1. Uniformity of hearth and thermocouple temperature.
2. Uniformity of temperature throughout the entire muffle.
3. Uniformity of temperature throughout the work area of the hearth.
4. Short time coming to temperature.
5. Fully automatic, straight line temperature control — permitting exact temperature control indefinitely.
6. Quiet operation.
7. Perfect insulation.
8. Low upkeep cost and fuel economy.
9. Door operation; foot pedal *and* hand control.
10. Designed for consistent operation at all temperatures up to 2500° F.
11. Low labor cost, because automatic temperature control permits operator to give all his attention to loading, timing, and quenching.
12. Front baffle tiles seal heat within the muffle and give flexibility in operating when door is raised or lowered.
13. Bridged hearth tiles carry all the load stresses—quickly removed for repairs.
14. "Pilot light" method of firing muffle atmosphere excess gases at combustion chamber vents.
15. Designed for low or high pressure artificial, natural, or propane gas—without changing burner equipment.
16. Correct atmospheres for steels quenched up to 1700° F. without muffle gas addition.
17. Simplified atmosphere control for hardening above 1700° F. including High Carbon-High Chrome and Molybdenum High Speed steels.



If your work involves the heat-treatment of tool and alloy steels—from the simplest straight carbon type on through the various moly high speed steels—you will be interested in the DELAWARE CONTROLLED ATMOSPHERE FURNACE. Representing a development of many years of heat-treating experience, it embodies patented features which make it the most perfect heat-treating tool of its kind.

DELAWARE
TOOL STEEL CORPORATION

Manufacturers of Fine Tools Since 1918

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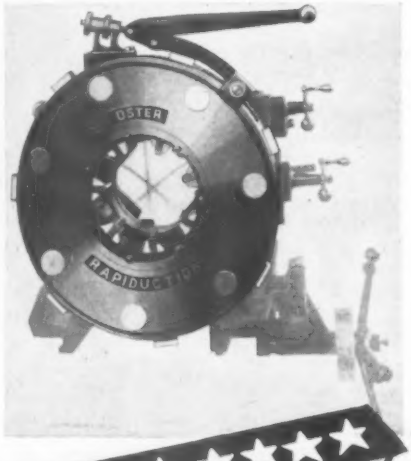
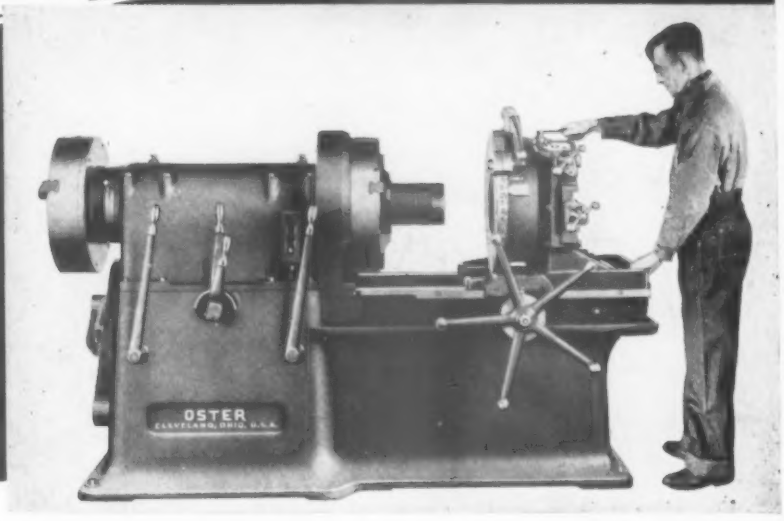
"Rapiduction"

HIGH SPEED PIPE THREADING

(above) "RAPIDUCTION" Die-Head adjusted to thread smallest size within range.
(below) The same "RAPIDUCTION" Die-Head adjusted to thread largest size within range.





Quickly Adjustable, Single Die-Head Threads Complete Range of Each Machine

WITH NEVER A DIE-HEAD CHANGE!

● The "RAPIDUCTION" Die-Head is one of 15 important features of Oster "RAPIDUCTION" high speed, high production power threading machines.

The "RAPIDUCTION" Die-Head with one set of holders covers the entire range of each machine and a single set of high speed steel chasers threads all sizes of American National Pipe Threads where pitch and taper are the same. Any one or more chasers in the set can be replaced without renewing the entire set.

Three Sizes of "RAPIDUCTION" Machines

No. 6-A: Pipe range: 1½" to 6". Bolt range: 1" to 2".
No. 8 : Pipe range: 2½" to 8". Extra range: 1½" & 2".
No. 12 : Pipe range: 3½" to 12". Extra range: 2½" & 3".

Typical "RAPIDUCTION" Speeds

No. 6-A threads 1½" pipe in 11.3 seconds; 3 inch pipe in 25.3 seconds. No. 8 threads 6" pipe in 66 seconds. No. 12 threads 8" pipe in 86.7 seconds; 12 inch pipe in 190 seconds. Other sizes of pipe in range of each machine are threaded at comparable high speeds.

Write for illustrated Catalog No. 43.

OSTER MACHINES
Save Money
to Help You Buy
WAR BONDS

OSTER

THE OSTER MANUFACTURING COMPANY • 2063 E. 61ST St. • Cleveland, O. • U.S.A.

HOW TO GET THE *most economical solution* to your milling production requirements

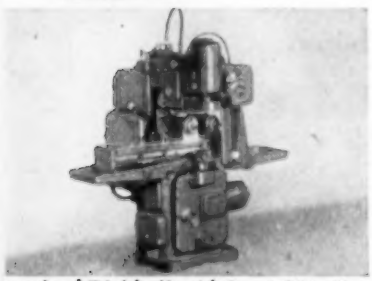
SUNDSTRAND ENGINEERS can solve it whether it requires...

1 Standard RIGIDMILS with Standard Tooling

Standard Rigidmil with Standard Tooling

Whenever possible, milling production problems are solved most economically by standard Sundstrand Rigidmils using standard attachments such as vises, indexing bases, vertical heads and any other standard equipment which can solve the problem economically. Next most economical solution is...

2 Standard RIGIDMILS with Special Heads andTooling



tandard Rigidmil with Special Tooling

Standard Sundstrand Rigidmils are designed to accommodate the application of a wide variety of special heads and tooling. Consequently, an unlimited number of milling production problems can be solved with special arrangements of standard Rigidmils. When not economical to do this, our Engineers can design...

3 Entirely Special Machines

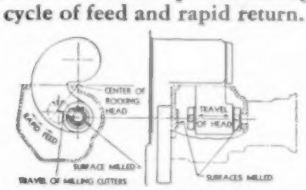
These machines are designed only when the required production cannot be obtained most economically by either of the foregoing methods.

Milling Internal Gear Bosses

The design of this transmission case is such that it placed a limitation on the size of the cutter head that could be used. The drawing below illustrates the method in which these out-of-the-way bosses were reached.

Operations—The operations consist of milling one of the bosses first, then shifting the cutter head and milling the other bosses.

The Machine consists briefly of a compact cast iron base having a rotating drum type spindle carrier. The drum is powered for rotation to rock the cutter spindle through a cycle of feed and rapid return.



Get These Free Booklets or Call in a Sundstrand Production Engineer

These free booklets cover the entire range of Sundstrand Standard Milling Machines. Write for them today. Ask for bulletins 818. If your problem cannot be met with these standard millers our engineers will be glad to assist in the designing of a special machine to do the job economically.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS U.S.A.

ARMY NAVY

SUNDSTRAND MACHINE TOOL CO.

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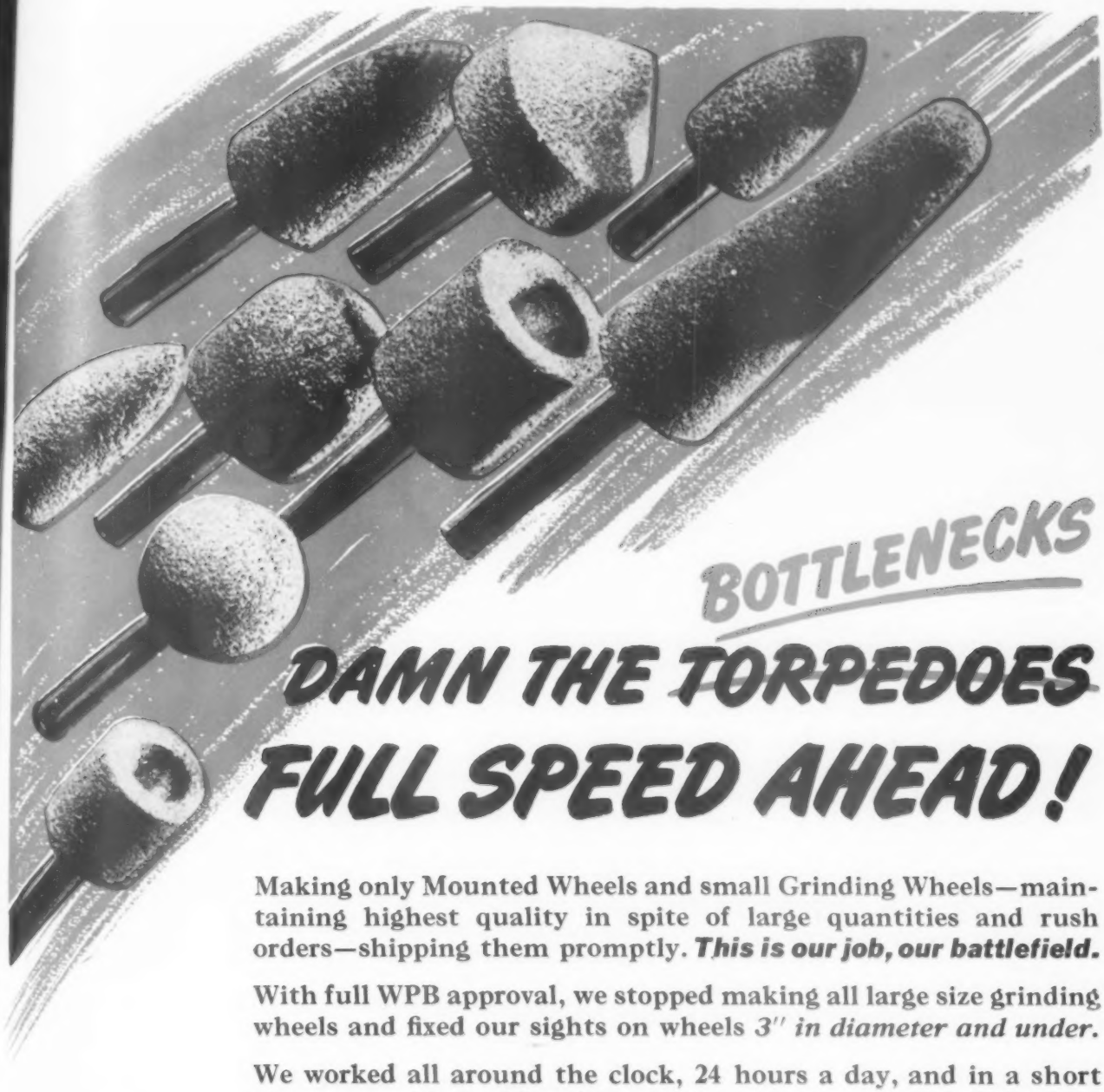

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DAMN THE TORPEDOES FULL SPEED AHEAD!

Making only Mounted Wheels and small Grinding Wheels—maintaining highest quality in spite of large quantities and rush orders—shipping them promptly. ***This is our job, our battlefield.***

With full WPB approval, we stopped making all large size grinding wheels and fixed our sights on wheels *3″ in diameter and under.*

We worked all around the clock, 24 hours a day, and in a short time were able to fill orders on time—And, our central location cuts time in transit. Today, there is no waiting. With the Army-Navy E at our masthead, we are going full speed ahead.

AMERICA'S HEADQUARTERS FOR MOUNTED WHEELS SMALL GRINDING WHEELS

Half a century of specialization has established our reputation as the Small Wheel People of the Abrasive Industry. You can bank on us.

TEST WHEEL FREE—To get acquainted with Chicago Wheels, let us send one postpaid. Tell us size wheel and material you wish to grind.

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CHICAGO WHEEL & MFG. CO.

1101 W. Monroe St., Dept. TE, Chicago 7, Illinois

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Name _____

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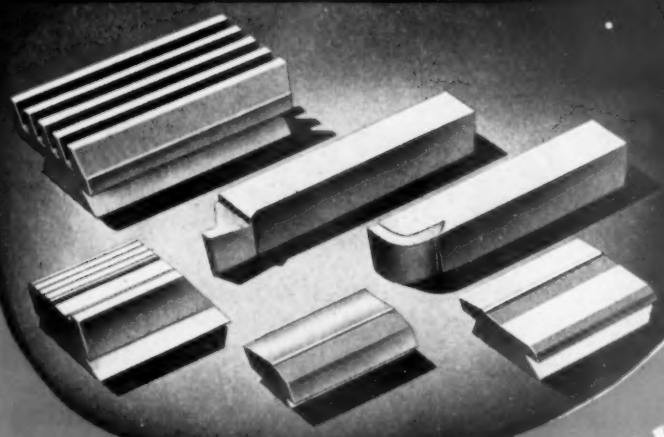
MORE AND MORE OF AMERICA'S FOREMOST MANUFACTURERS ARE RELYING UPON THE SUPERIOR PRODUCTION FACILITIES OF LAKE SHORE FOR THEIR REQUIREMENTS IN FLAT AND DOVETAIL FORM TOOLS.

CRANE

Allison



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Send us your blue prints for quotations on your high speed tool, special tool, and carbide production tool requirements.

One of America's Leading Toolmakers

816 NORTH KOSTNER AVENUE • CHICAGO 51, ILLINOIS

Sidney Lathe PRECISION

meets the close tolerances of airplane manufacture

Easy to hold to infinitely close tolerances—rigid from the base up—smooth flowing power—sum up briefly the inherent qualities of Sidney lathes that adapt them to precision operations demanded in airplane construction.

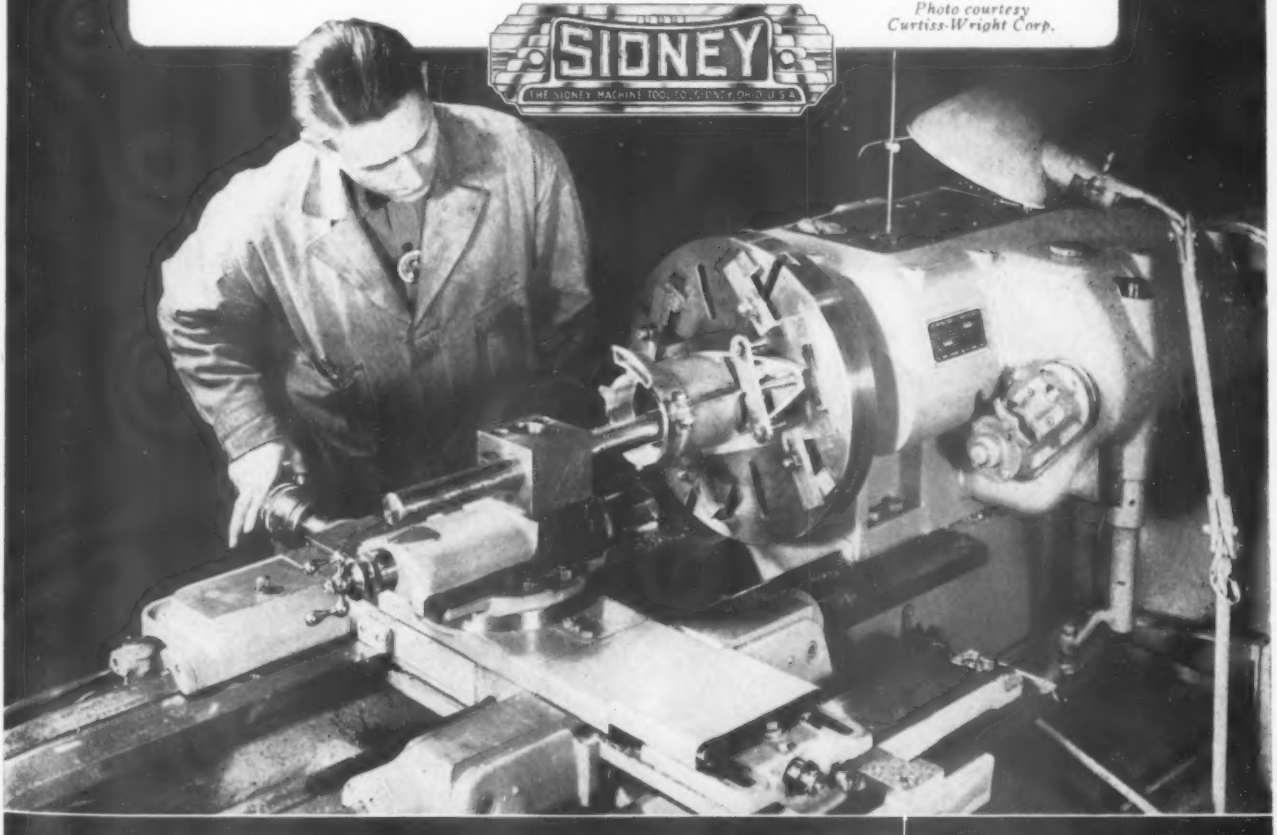
This illustrates but one of the Airplane Manufacturers who are now using not just one machine but batteries of Sidney Lathes on a host of widely different operations.

Your job may not be identical to this but if it calls for sustained accuracy over long periods it may best be done on a Sidney Lathe.

Built in 14" to 36" capacities to cover a wide range of manufacturing applications.

Bulletins available for each model.

Photo courtesy Curtiss-Wright Corp.



The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

2 Things to Remember

WHEN YOU ORDER HACK SAW BLADES

"A Borg-Warner Product"

First You need not be seriously handicapped by the restrictions on 18-4-1 for Hack Saw Blades, due to the shortage of vital alloys. The timely development of D-B-L Steel gives you lower cost blades with tough cutting edges, high impact resistance, and relative freedom from decarburization.

Second Only Ingersoll Steel Mills have had 4 years' experience in producing sheets of D-B-L Steel exclusively for Hack Saw Blades.

Blades made of Ingersoll D-B-L Steel are available from leading makers of Hack Saw Blades. Be doubly sure of satisfaction by specifying—"Made of Ingersoll D-B-L Steel"—on orders for Hack Saw Blades.

INGERSOLL D-B-L HACK SAW STEEL

(Tungsten 5.00-6.00
Molybdenum . . 4.00-5.00)

The remarkable performance of Ingersoll D-B-L . . . its relative freedom from decarburization . . . its tough cutting quality and its high impact resistance . . . plus its lower cost, have made it a wartime favorite.

INGERSOLL SPECIAL STEELS FOR SPECIAL USES

Alloy Steels	Soft Center Steels
Armor Plate	Shovel Steels
Clutch Plate Steels	Knife Steels
Tillage Steels	TEM-CROSS Steel

IngAclad (Stainless-Clad Steel)
Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels.

INGERSOLL STEEL & DISC DIVISION

BORG-WARNER CORPORATION

NEW CASTLE, INDIANA

Plants: New Castle, Indiana; Chicago, Illinois; Kalamazoo, Michigan

INGERSOLL D-B-L HACK SAW STEEL

ractical Boring to Limits Like This:

+.0002" −.0001"

PRECISION BORING DATA

PART—End Bracket.
MATERIAL—Cast Aluminum with 1020 Steel Insert.
HOLDING METHOD—Special Fixture.
LOCATION—On Rabbit Fit Dia.
MACHINE—#200 Simplex Precision Boring Machine.
OPERATION—Bore 1.0230" Dia. Hole.
TOLERANCES—+.0002", −.0001".
FEED—1⅞" per Minute.
SPEED—1150 r.p.m.
FLOOR-TO-FLOOR TIME—4 Minutes, including inspection time.

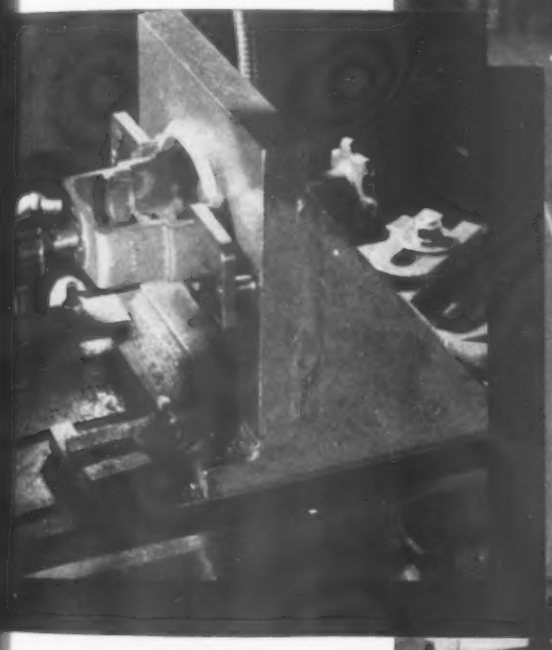
SIMPLEX UNIT-TYPE BORING MACHINES OFFER *Precision, Versatility and Speed*

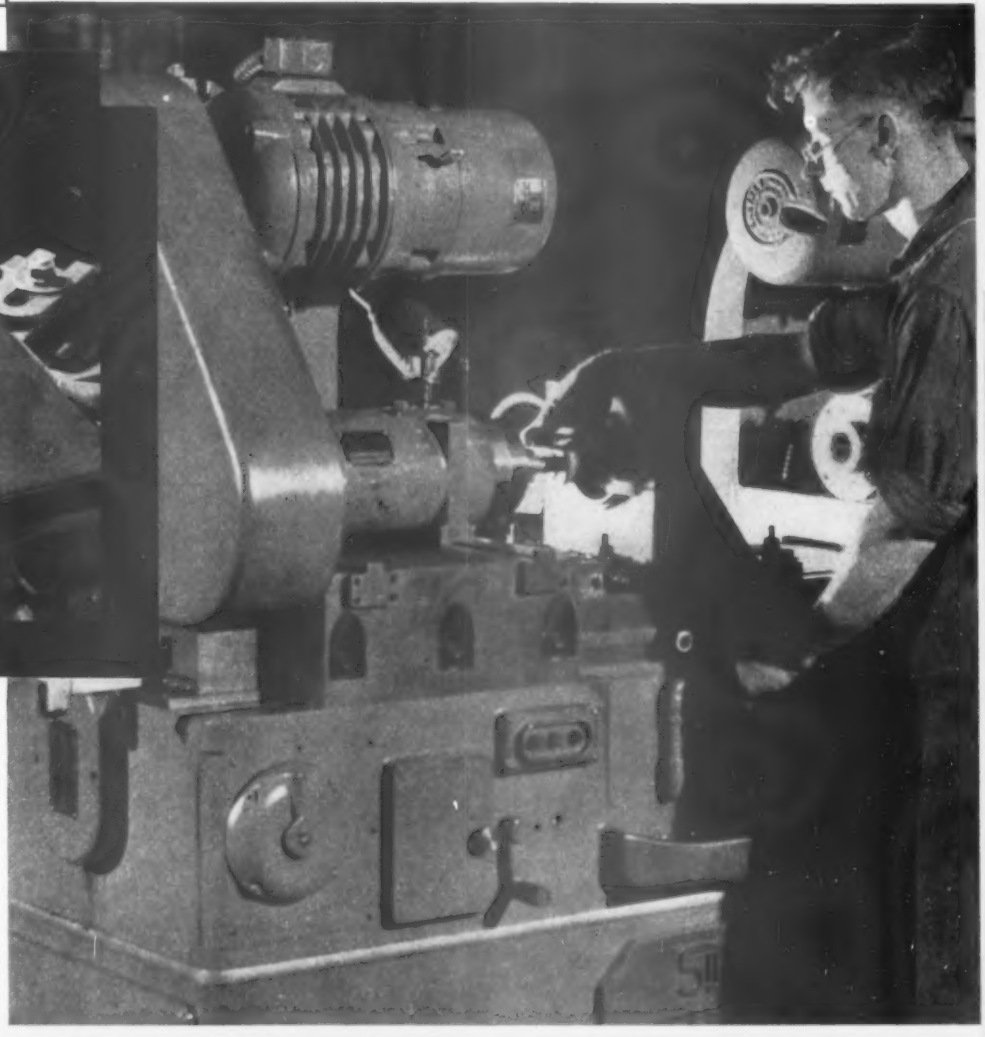
This Simplex Precision Boring Machine is designed for plants having a number of jobs of varying types to be handled by one machine. The bridges are made so they can be easily adjusted to suit the part being machined. A built-in electric facing control is provided with adjustable dwell.

END BRACKET PRECISION BORED IN 50 SECONDS

In this installation, an end bracket bore is machined to 1.0230" (+.0002", −.0001"). Boring Time is only 50 seconds. Finish is very smooth, and approximately 100 brackets are machined per tool sharpening.

Perhaps one of our 25 different basic models of Simplex Precision Boring Machines will serve you as well. Our engineers will be glad to make a study of your parts and production for faster and better precision boring. Send your part prints and production figures . . . no obligation.





FREE DATA

Write for these two booklets covering our complete line of precision boring machines. Complete specifications of each type are included. Ask for precision boring machine booklets.

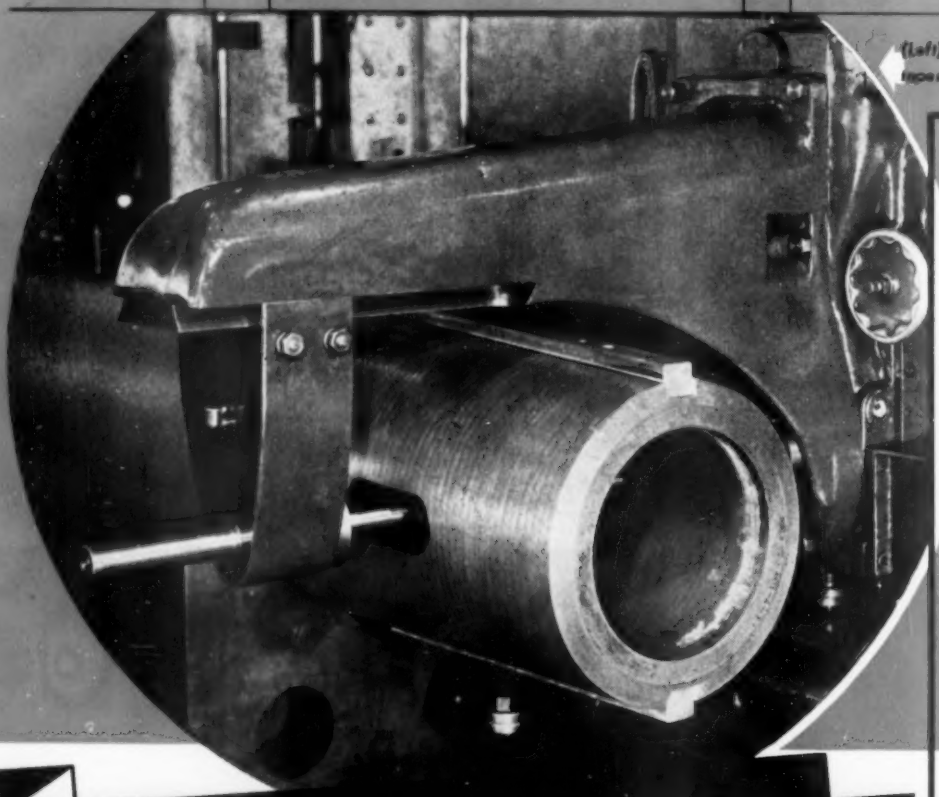
STOKERUNIT CORPORATION

GNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

4528 WEST MITCHELL STREET • MILWAUKEE, WISCONSIN

How this Manufacturer Machines a 50' x 16" diameter SHAFT

Drawing illustrates amount of overhang of shaft in relation to the floor plate.



(Left) Operation No. 4. Machining taper keyway as described below.

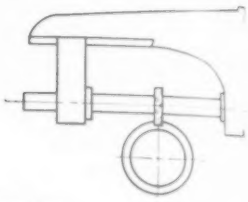
Keyways Machined in 12-ton Part with Time Savings of 75%

● Perhaps your work does not include machining of large, unwieldy parts. However, this is an interesting example of how this manufacturer's ingenuity in tooling a standard Giddings & Lewis Floor Type Machine saved 75 per cent in machining time. The problem consisted of machining 2 standard keyways and 1 taper keyway in the end of the shaft. After machining several shafts with conventional end mills, he designed and built the arbor-support shown, and changed his method of machining. Details of the job are shown in the panel at the right.

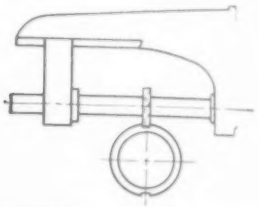
Where work is large and unwieldy, the G. & L. Floor Type Machine can be applied in an almost endless variety of machining possibilities. When provided with standard G. & L. attachments and accessories, their flexibility is increased further.

Our engineers will be glad to work with you, either assisting in the selection of the G. & L. best suited to your work, or studying and recommending tooling best fitted to your particular requirements.

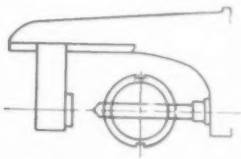
DETAILS OF OPERATION



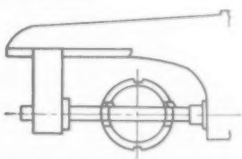
1st Operation
Mill keyways with staggered tooth keyway cutter with rounded corners. Keyway is 1⅞" wide by ⅞" deep by 27" long.



2nd Operation
Index shaft 180° and repeat operation No. 1.



3rd Operation
Drill two 2¼" diameter holes for taper cross key.



4th Operation
Machine to size with single point tools, using column feed. The taper is obtained by swinging the shaft, parallel with floor plate, to the proper angle in relation to the machine spindle. The keyway tapers from 6¾" to 5¾".

Additional Data

...covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin No. 115.

GIDDINGS & LEWIS MACHINE TOOL CO.

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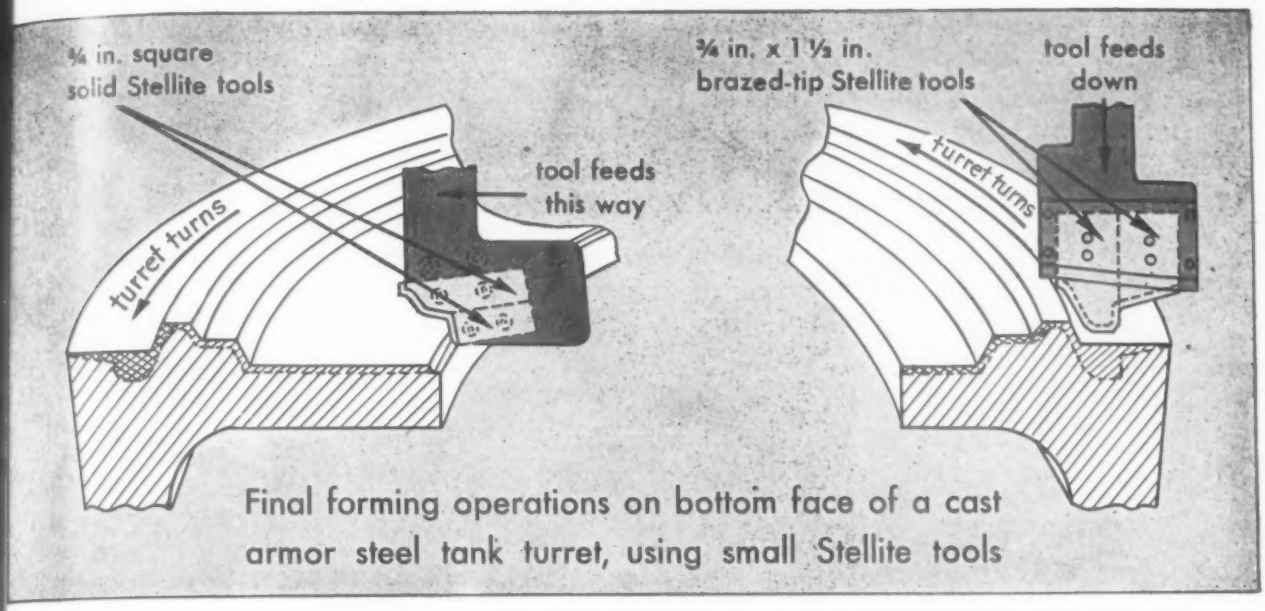
Through the Use of These Tool Holders Small Stellite Tools Are Used for Forming Operations



Final forming operations on bottom face of a cast armor steel tank turret, using small Stellite tools

The tool holders in the simplified sketch shown above are used in final forming operations on tank turret bottoms cast from armor steel. Each of these holders is designed to utilize two small Stellite tools in place of the large, fabricated tools that were formerly used. This results in important savings in tool cost and grinding time.

How Grinding Time Is Saved

Because the tools are small, handling is easy, and grinding is speeded up. Because the "split-tool" arrangement eliminates the combination of complicated angles and radii that make large form tools difficult to grind, further savings in grinding time are effected.

Less Tool Metal Is Used

Less tool metal is ground away with the "split-tool" arrangement than with single, large, fabricated form tools. This is because form tools usually wear faster on one part of the tool than on others. When large tools are used, failure at any point means that good metal is lost because the whole profile has to be reground.

Drawings Are Available

Haynes Stellite Company does not make or sell tool holders. If, however, you believe that the principles of these holders as developed by Stellite engineers would help you in your war-production work, further information—and detail drawings, if required—can be made available without cost. Write to any District Office, referring to this advertisement.

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Unit of Union Carbide and Carbon Corporation
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FOR HYDRAULIC AIRCRAFT UNITS

A disconnecting, self-sealing coupling that really works. One prominent aircraft manufacturer writes that he has "found that this coupling is of much sturdier construction and more fool-proof design than present equipment. The American Screw Products coupling has consistently withstood 2500 p.s.i. with only finger-tightening. A sample coupling purposely crush-tightened with a long-handled wrench did not leak upon disconnection, or re-assembly. The hydraulics section of Engineering has granted unqualified approval of this coupling."

These features are important: Heavier construction of the high-strength aluminum body prevents distortion under very severe handling conditions; jamming of spring-loaded shut-off valve is prevented. Light weight cast phenolic poppets are positive-sealing in action. Springs are made of finest heat-treated steel. Synthetic gasket provides leak-proof connection when coupled for service. Available with AC or AN threads. Write for full details and prices.

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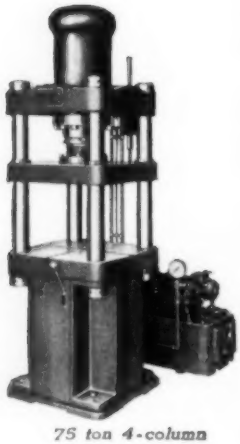
75 ton 4-column press, 30 inch stroke, sensitive pressure control.

75 ton 4-column platen press, 12 inch stroke, conventional control.

STANDARD PRESS DESIGN . . . with variations



75 ton 4-column platen press, sensitive pressure control.

15 ton 4-column platen press, 30 inch stroke, special control.

Hannifin hydraulic presses provide all the advantages of standardized construction, with welded frames and bases, precision hydraulic cylinders, built-in hydraulic power, perfected controls, compact and simple installation, *plus* flexibility to meet individual needs. Table construction, gap, reach, and ram stroke may be readily modified, avoiding the delays incident to special design.

The two 75-ton four column presses are examples of variations readily made in one basic design. Both press tables are 60 inches between columns. The unit with platen has 12-inch stroke and is equipped with conventional 4-way valve control. The other press has a guided ram, 30-inch stroke, and sensitive pressure control.

The 15-ton long stroke platen press can be furnished with or without platen, and with modifications of stroke, speed, control and table construction to suit a wide range of work.

The 75-ton standard 4-column platen press is equipped with sensitive pressure control, and is adapted to many types of forming, pressing, and assembly work. Modifications of stroke, speed, control, and table design can be made promptly.

The 35-ton open gap type straightening press has sensitive pressure control, table 120 inches, and fixture rails 26 feet long, carrying roller type fixtures. Presses of this type can be modified to provide reach, gap, stroke, table and fixture design to suit individual needs.

Hannifin hydraulic presses are built in a complete range of types, capacities 5 tons to 200 tons, for straightening, forming, press-assembly, and similar operations. Write for press bulletins.

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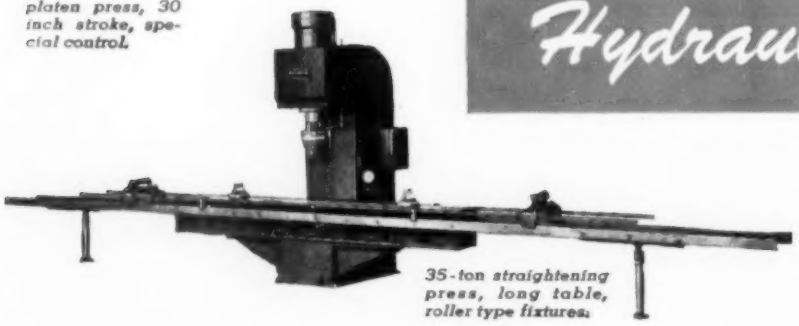
HANNIFIN *Hydraulic* PRESSES



35-ton straightening press, long table, roller type fixtures.

Write for bulletins giving complete specifications of Hannifin products: Hydraulic Presses, Bulletin 60; Pneumatic Cylinders and Air Control Valves, Bulletin 57; Hydraulic Cylinders, Bulletin 35; Pneumatic Arbor Presses, Bulletin 46; Quenching Press, Bulletin 58; "Allen" Pneumatic Riveters, Bulletin 43; "Hy-Power" Hydraulic Riveters, Bulletin 53; Air Pressure Regulating Valves, Bulletin 56; Pneumatic Vises, Bulletin 59.

PRODUCTION PERSPECTIVES

T.M. REG. U.S. PAT. OFF.

WAR PRODUCTION: After resumption of upward trend in August, output leveled off again in September, the number of units produced in some categories actually dropping....Apparent Reasons: Cut backs; design changes; manpower shortages; and, according to WPB, poor management controls.

OUTLOOK: Government officials can't admit it, but pushing mass production industry output much higher will require devices yet undiscovered....Look for continued gains only in aircraft and components....Materials are available for increases in certain other programs, but manpower is lacking.

BOOM BUSINESS: Shipbuilding, along with aircraft, has become a wart-time U. S. mass production industry. Building facilities have increased from 21 yards and 100 ways to 70 yards and more than 300 ways . . . . Absenteeism was largely responsible for a drop in September output of Maritime vessels from 164 to 160.

AIRCRAFT: Widespread belief that September production fell off brought comment from military authorities that output approximated August's 7,612 planes, that schedules were disturbed by design changes....At press time, WPB's Charles E. Wilson said the aircraft "production curve is steadily rising", that we will soon reach a rate of 105,000 planes annually, 8,640 monthly.

PRODUCTION ACHIEVEMENTS: Pacific Coast plane plants have increased output 4,260 per cent - while increasing employment only 933 per cent....Aircraft and aircraft equipment comprise more than 50 per cent of Army's projected 1944 production program . . . . Stumbling Block: The industry estimates 1,7000,000 additional workers will be needed by spring.

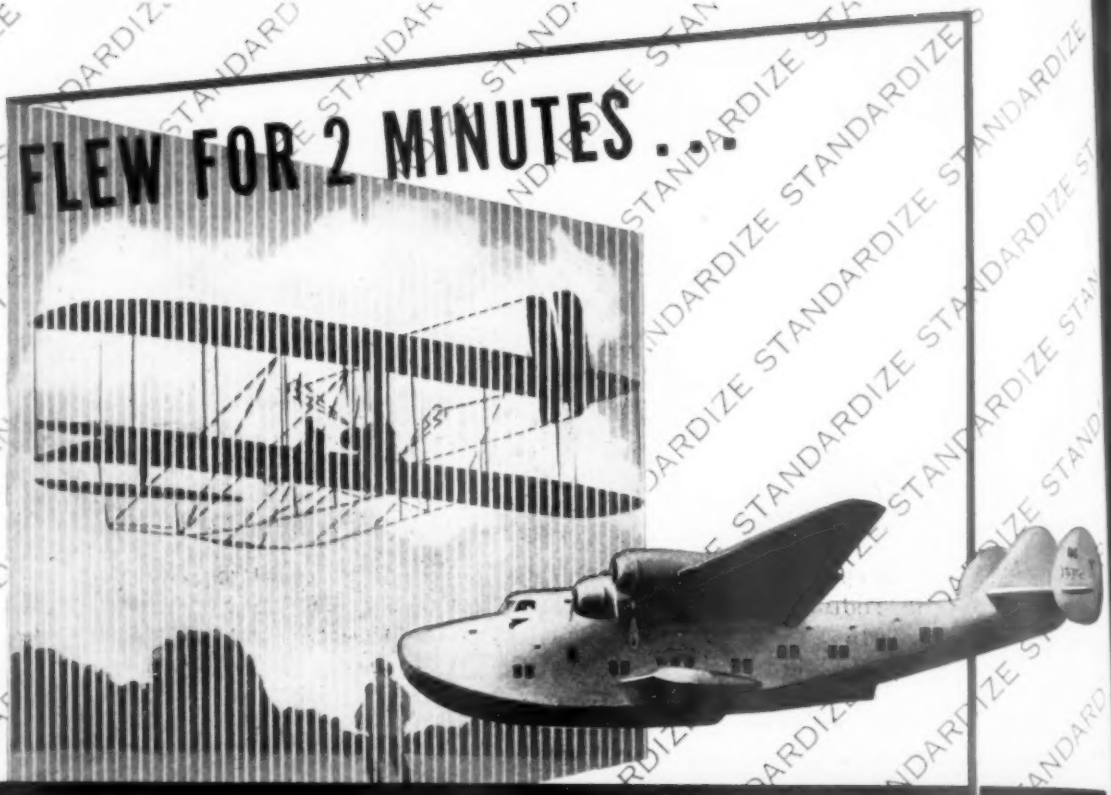
MANPOWER: Some top WPB officials are beginning to blame management for the drag in war production, say that trouble lies in spreading too thin the supply of prewar experienced production executives . . . . Production on sub-contracted component basis is so complicated that slight inefficiencies slow it down....Believe It or Not: WPB may charge management with failure to make workers produce more!

WASTE: Government planning has helped industry little with its manpower problems....Big manpower loss has resulted from failure of McNutt "freeze order", continued job changing, training replacements....More than 25,000 have been changing jobs monthly in Detroit's 67 largest plants.

TROUBLE: Smaller War Plants Corporation is on dead center, may not live through the winter....Internal bungling plus "insolvable problems" inherent in production distribution picture has the agency reeling.

MATERIALS: Talk of partial conversion to civilian production is pointless unless materials situation is considered....Here's the outlook this month: Aluminum--plentiful; Tin, Lead, Zinc, Chrome, Nickel, and Tungsten--barely enough to meet war production needs; Alloy and Carbon Steels--short for war nsede....Civilian production? Only with non-critical materials, in non-critical labor areas, and restricted to repair parts or war-models of most-essential civilian commodities.

THEY FLEW FOR 2 MINUTES . . .



TODAY . . . *We Span the Oceans*

The contrast in performance between now and the first days of airplanes is one way of looking at their amazing progress. But it's *not* the most vital difference. The real difference between today and 1903 is that today we can build 8000 planes a month.

What has brought about this progress? Mass production? The assembly line? Yes, but before these were possible, there had to come STANDARDIZATION — the adoption of standard interchangeable parts which would assemble instantly without "hand fitting." This basic feat with its attending economies has made available to many, in all fields, products that were formerly available only to a few.

The use of *standard Screw Thread forms and sizes* has contributed enormously to this simplification of manufacture. A more universal adoption of these standards can carry their benefits still further in the years immediately ahead.

Standard Threads- SAVE TIME - SAVE MONEY!

Full utilization of existing accepted sizes, pitches and forms can bring lowered costs to all manufactured products because: (1) it speeds production; (2) it reduces inventory. NOW, when plans for new and better products are taking shape —now is the time for a united effort to bring about greater standardization of threaded parts

Send for booklet "Selecting the Right Tap for the Job" — 18 pages of Facts, Tables, Suggestions

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD
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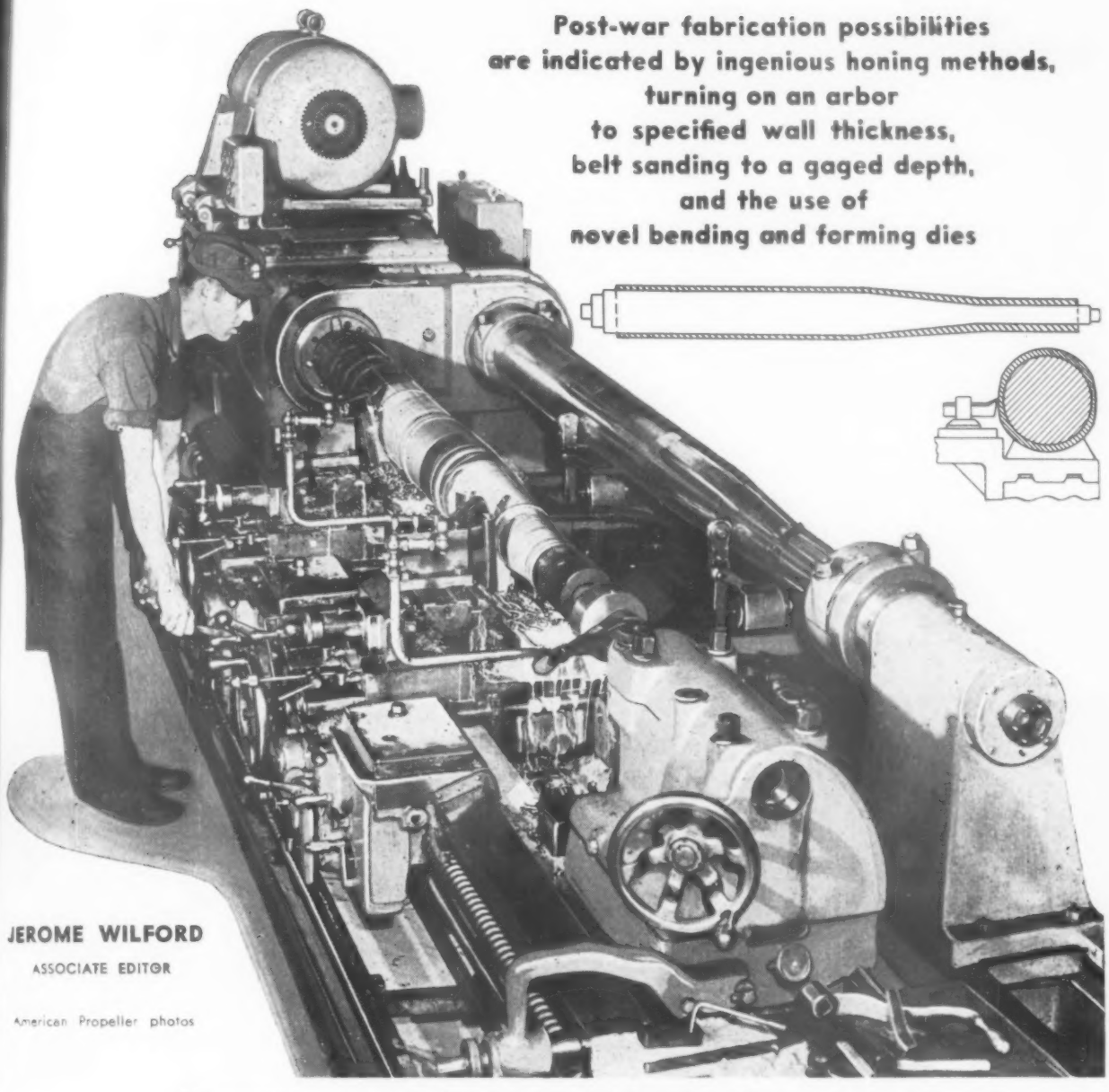
Post-war fabrication possibilities are indicated by ingenious honing methods, turning on an arbor to specified wall thickness, belt sanding to a gaged depth, and the use of novel bending and forming dies



JEROME WILFORD

ASSOCIATE EDITOR

American Propeller photos

The swaged tube is shrunk onto an arbor so that the outer surface may be turned in accurate relation to the inner surface.

On fixture shown above, the master cam at right guides a hydromatic follower, which controls cutting of the longitudinal taper and lateral variation of steel tubes to develop the wall thickness of propeller blades. Drawings show tube as fitted to the arbor, and illustrate the variations in wall thickness.

FORMING PROPELLER BLADES FROM *STEEL TUBING*

PRODUCTION of hollow steel propeller blades from seamless or welded tubing has resulted in reducing substantially the number of operations ordinarily required to form this aircraft part. However, the peculiarities of shape and operations used in this process have introduced some unusually interesting machining and manufacturing set-ups.

The success of this manufacturing method strikes a prophetic note for future types of jobs which production engineers may be called upon to tool. Machining of a propeller blade in its entirety demands ingenuity, not only in designing the holding, and gaging fixtures, but also in developing the intricate contours on production equipment, particularly in this instance in which the blade is made from tubing.

The sequence of operations required in manufacturing these propeller

Inspection readings marked at specified stations on tube surface guide operator making visual indications with spot-facing machine.

Additional surface to be removed by belt sanding is shown by spot-facing operation. One-quarter-inch end mill is set by vernier adjustment to spot-face the tube according to stages laid out by a cage template in relation to the blade's wall-thickness chart.

blades is fairly simple. Work moves freely, with no backtracking. All operations are different, as concern the type of equipment used, so that straightline arrangement of equipment is economical and production flow is orderly.

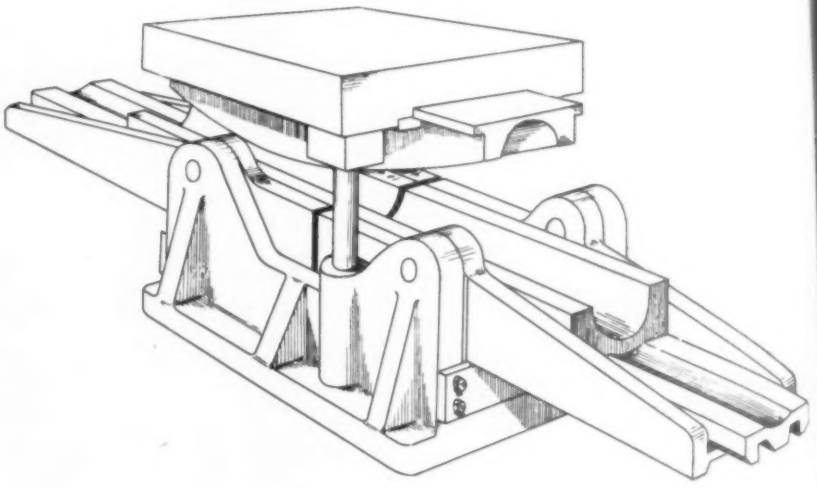
The plant of the American Propeller Corporation, (a subsidiary of The Aviation Corporation), which is building hollow-steel, one-piece propeller blades, is little more than one year old. Designed in accordance with procedure established in a pilot plant, its modern facilities are arranged to permit processing more than one design of blade at the same time.

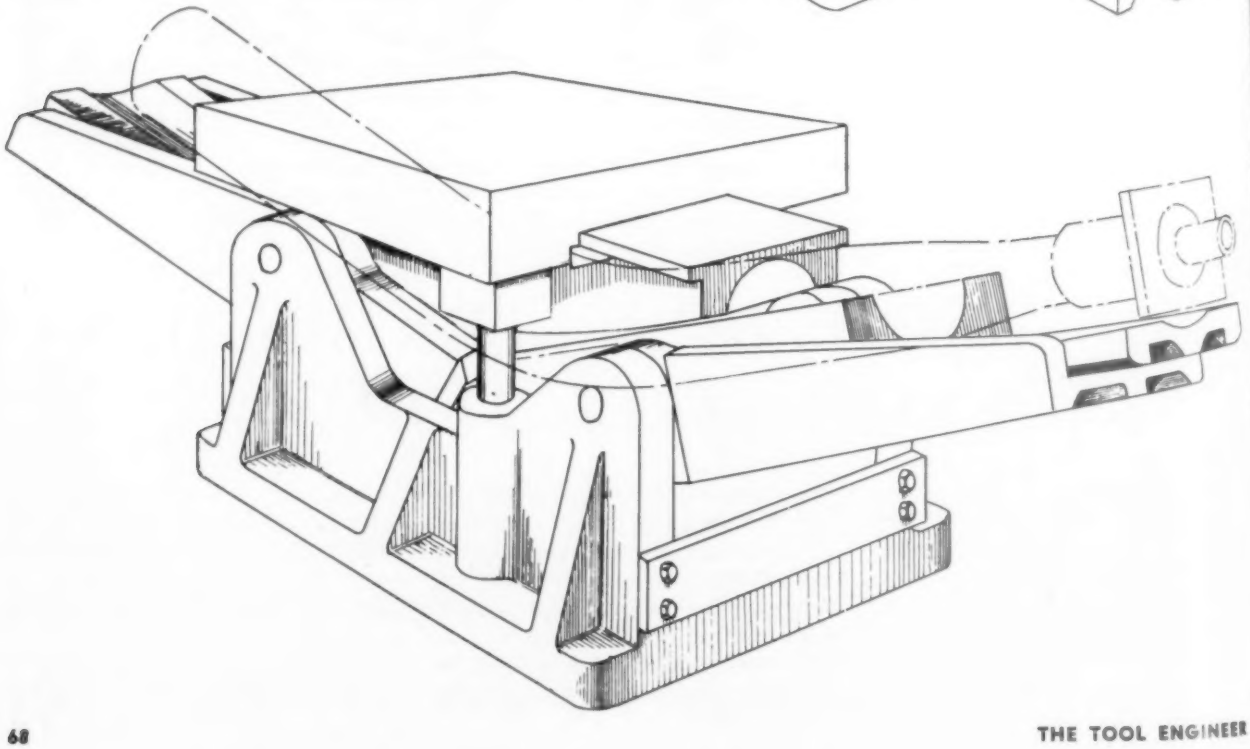
Space for storage of parts required for production flow has been provided excellently. This provision is lacking in some aircraft parts plants that

In bending dies, the tube is shaped to provide contour for the leading edge.

Right:
Isometric drawing of tube bending dies.

Below:
As upper die descends on steel tubing, lower die, in two sections, draws apart in hopper fashion to support work and provide clearance for curved section.





were set up for high production before the complexity of producing such products for military purposes was realized.

The manufacturing process incorporates coordination of three major factors—metallurgy, production engineering, and ingenious tooling. Metallurgy plays an important role in production because the material for the blade is a chrome nickel molybdenum steel, ordinarily tough to machine. By annealing the material in a 20-hour sequence above the critical point, slow cooling maintains the relatively ductile characteristics desired for machinability.

HONING THE TUBE

Certain of the machining and handling operations are more interesting than the step-by-step sequence of operations in producing the hollow propeller blade. They stand out as highlights against a lightly sketched background.

First the tubing is cut to size, then honed to establish accurate inside diameters throughout. With blades running from approximately 4 to 12 feet overall, and varying in diameter from 6″ to 10″, the horizontal honing machine must be at least 30 feet in length. From .030″ to .050″ of stock may be removed by honing.

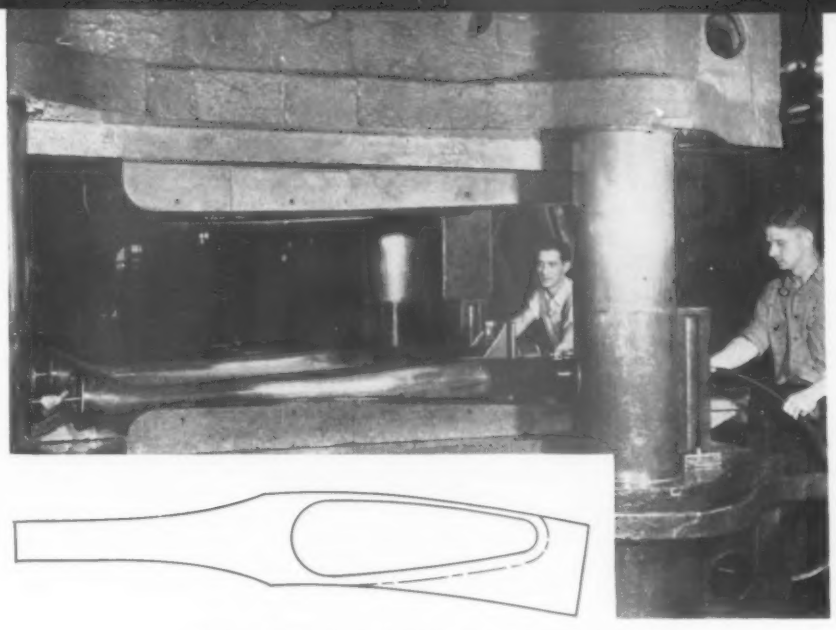
However, because of irregularities in the stock and the difficulties encountered in maintaining high accuracy in swaging or upsetting, variations in wall thickness must be expected and corrected.

REGULATING WALL THICKNESS

The finish-honed tube is next swaged on one end to produce a taper and an elongation of about 4½″ on a medium sized blade. Upsetting shortens the tube again by thickening the shank end of the blade. Except for the shank, the work is now of a wall thickness approximating that of the greatest thickness in the finished blade.

One of the most important operations is that of varying the wall thicknesses proportionate to high and low stresses on sections of the working blade.

Pertinent to this machining task is a set-up method which permits accurate location of the external diameter or periphery in relation to the internal periphery. Obviously, there is no point in removing a given amount of stock from the O.D. of the tube if the I.D. is not accurately located, that is, if the wall thickness which will result cannot be accurately maintained. Because of variations, the same amount of stock will not be removed from the surface in every instance, yet the same amount must be left between the I.D. and the O.D. so that wall thickness will be produced according to specifications.



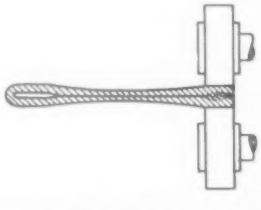
Swaged, upset and turned tubes are flattened.

Internal pressure is used to prevent cracking the metal. Note hose connected at right.

In order to assure accurate location and to produce this dimension as specified, the tube is shrunk on an arbor of precise dimensions. However, the problem is not so simply solved, for the internal periphery of the tube must conform exactly to the surface of the arbor.

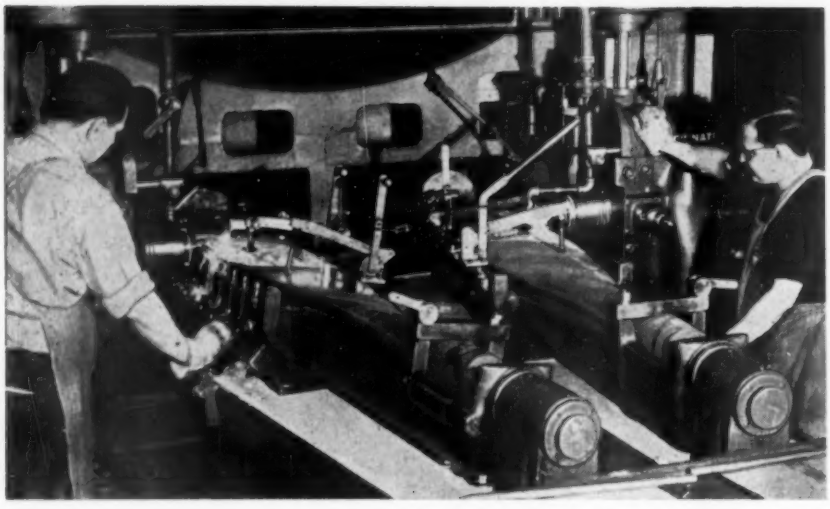
The arbor provided has an area slightly greater than that of the internal periphery of the blank, so that conformity is assured, and the tube is held rigidly to the arbor. Otherwise, in shrinking to the arbor, variations in size of the tubing might result in lack of contact with the arbor at points, preventing accurate machining of wall thickness in relation to the arbor.

Further—and here metallurgy takes



Tip and trailing edges are seam welded.

Electronic control has been developed in which a template is used to mark the path followed by roller-type electrodes.



Milling off the trailing edges.

Two at a time, blades are machined in a special duplex fixture.

part—in shrinking the tube onto the arbor, temperature control is important. The tube has been heated to expand it sufficiently to permit entrance of the arbor. But heat must not be raised above the critical point which will result in loss of machinability or create a condition where the tube would shrink to a tight fit and then spring away. Regulated cooling is again an important factor in maintaining physical requirements.

With the tube shrunk on the arbor, the fixture and work are centered in a special lathe, and the blank is machined. Automatic tool feed must provide for three factors: (1) the tapered form of the workpiece, (2) the varying thicknesses specified between shank and tip, and (3) variations in thickness on the circumference of the tube.

Concerning variation on the circumference, stock is removed to predetermined depths on the surfaces which are to become faces. In general, these exist between two lines parallel to the axis of the arbor and at 180° from each other, representing the leading and trailing edges of the blade. On these edges, stock remains substantially as furnished in the tubing blank.

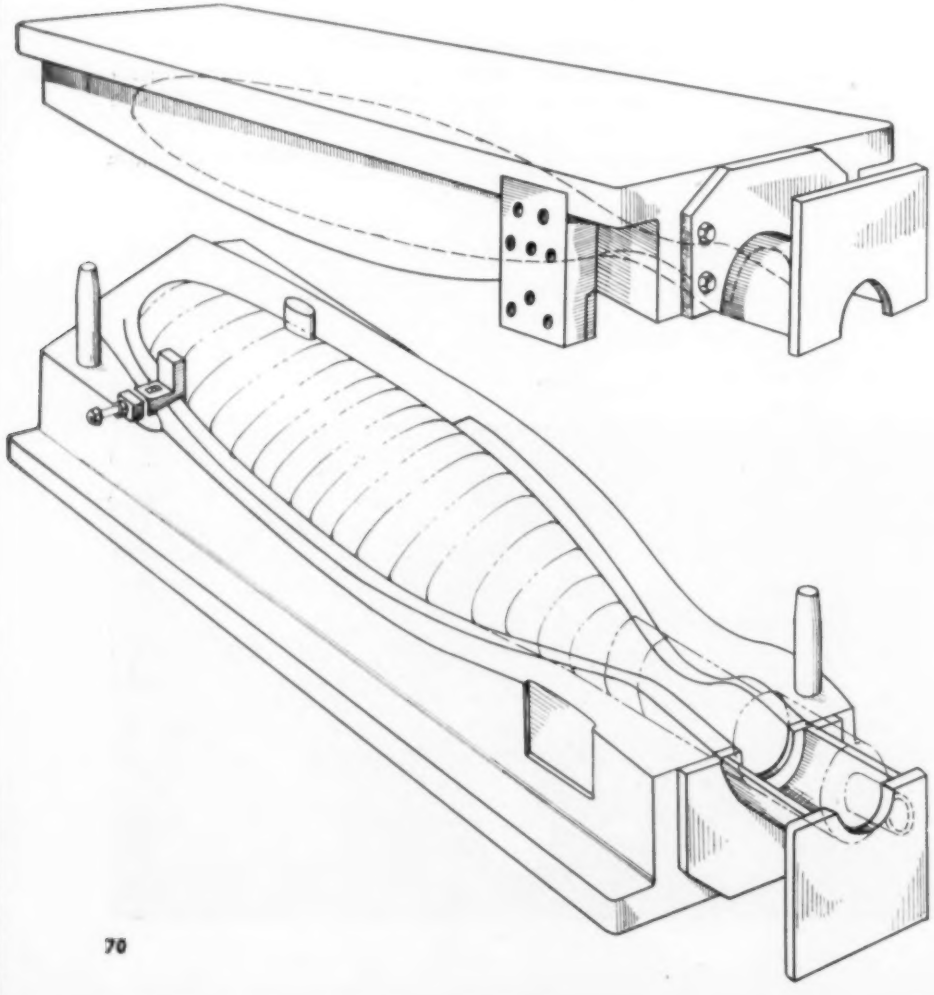
This machining operation is made possible by the application of a hydraulic follower on a cam, which guides the lathe tool accurately.

After machining, the tube and arbor are inserted in a sub-floor electric furnace. When sufficiently hot, the assembly is quenched. The tube takes a quick set in expanded condition and, as the slower-cooling arbor inside it shrinks to normalcy, it is easily withdrawn. Close temperature control is essential in this step, in order that the expanded set of the tube be of the dimension required.

SANDING TO CORRECT DEPTH

The tube is then gaged to determine where the wall thickness may exceed specifications. With a cage template, these surfaces are outlined and laid off in stations. The tube, thus marked, is slipped over the rigid arm of a special inspection fixture. Mounted at the end of the arm is a small, electrically-wired disc roller, which, when brought in contact with the inside diameter of the tube, flashes a light on a dial indicator mounted immediately above it and bearing on the outside diameter. As the tube is turned and advanced, readings are taken from the indicator at marked stations on the tube. These readings show where surface thickness must be reduced, and the amount in each instance is indicated on the work at the point of excess.

Next, the work goes to a spot facing machine which can be pre-set on the head to cut to predetermined depths. At each checking station, the spot facer removes metal, or produces a hole, to a depth equal to the excess at that point. The part is then ground



Propeller blades "blown up" to shape.

Accurate contours of American Propeller blades are established by expanding with internal pressure in forming dies.

overall with a belt sander until the holes produced by the spot facer are obliterated — but not beyond that point — indicating that the excess has been removed.

Thereafter, the tube is bent so that one side will conform to the contour required for the leading edge of the blade. The bending die used for this purpose is of ingenious design. While under it, the tube walls are supported by internal pressure, for which provision is made by welding a flange in the tip end and a pipe nipple and valve in the shank. The lower member of the die, formed in two sections, draws apart in hopper fashion as the upper die descends, permitting the tube, as it is curved, to descend between these sections, and at the same time letting it through the die sections. This progressively bends it to the required shape.

FORMING DIES

The tube is next flattened in a press, so that it becomes oval in cross section. The tip end, with welded flange, is sheared off under a die and sealed by welding.

Salient point in bringing the flattened tube to finished shape is the operation of pre-forming and final forming. This provides the face and camber of the blade.

After heating, it is placed in preform dies that are finely shaped to the contours of the finished blade. Internal pressure is exerted through the valve so that the blade will be inflated or forced by expansion into the contours of the dies.

Among intermediate steps between pre-forming and the final die forming operation is the highly developed process by which the tip and trailing edge of the blade are welded.

SEAM WELDING

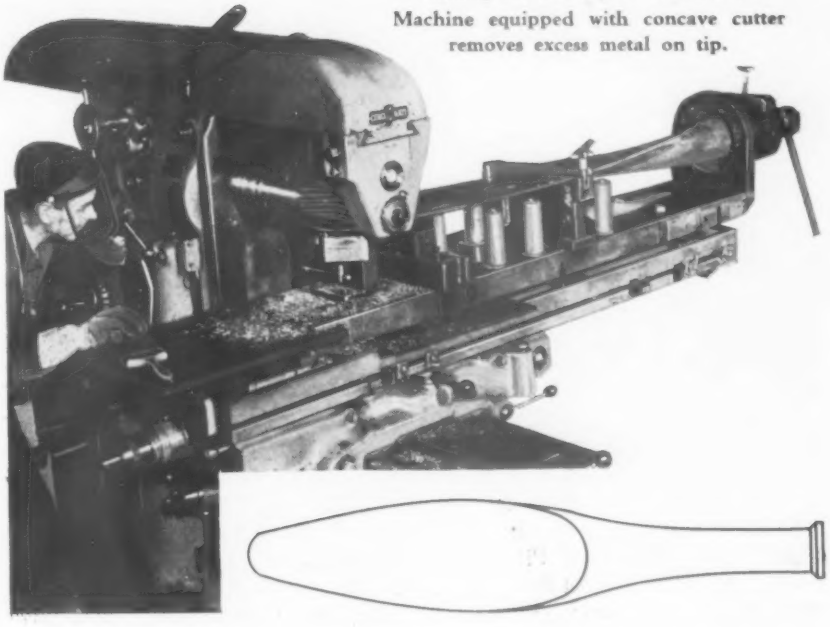
Electronic control has been developed for this phase, in which a template is used to mark the path followed by roller type electrodes. The welding electrodes must be turned down after each use to insure a perfect weld. Rolls are quickly changed so that little time is lost.

After the weld, the work is subjected to stress relief at 1225° F. for 1½ hours previous to shearing off excess metal outside the weld.

Final forming is accomplished in the same manner as pre-forming, except that the blade in this latter operation is die quenched.

Milling off the top of the blade.

Machine equipped with concave cutter removes excess metal on tip.



Another operation is interesting because of the fixture involved. This concerns finishing the shank of the blade. Seven grinding operations are required. To provide constant location and thus avoid accumulated error, to save time in handling the part for each operation, and to permit handling by relatively unskilled labor, a "shuttle" holding fixture was designed which grips the leading and trailing edges of the tip in a two-jaw floating chuck and secures the shank between four centering pins. A two-point "wiggler," and dial indicator are used to guide alignment of the blade's center line with that of the shuttle.

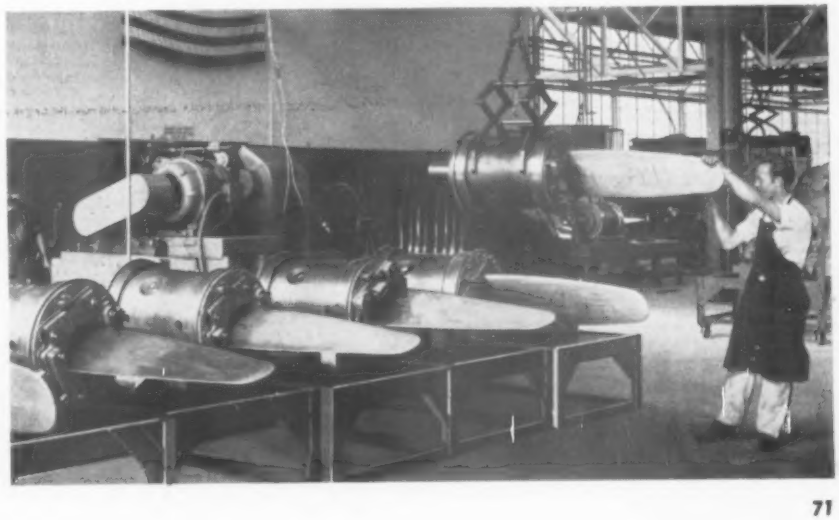
With the blade supported in proper alignment in the shuttle, this fixture is revolved to permit finishing of the shank end by an external traversing head grinder. The internal diameter, chamfer, counterbore, a balance-weight seat, and a thread relief are completed by moving the shuttle and blade to the machines for the various operations, which insures concentricity between the outside and inside diameters of the blade shank.

Final operations include polishing, balancing and pentrating.

THE END

Blades mounted in special shuttles reduce location problem for a series of seven internal and external grinding operations on shank.

With blade supported in proper alignment in the shuttle, the fixture is revolved to permit finishing of the shank end by an external traversing head grinder. I.D., chamfer, counterbore, balance weight seat and thread relief are completed with only one locating operation.



INCREASE PUNCH LIFE

Development of tungsten-carbide punch and die inserts permits economical slotting and notching of rotor and stator laminations on limited production

USING tungsten-carbide tipped dies on an indexing press has provided a production advantage by increasing life between grinds five to eight times over that with high speed steel.

This is the result of an experiment, now established practice, in notching or slotting the laminations for rotors and stators for special-design electric motors produced in the Westinghouse Shops at East Pittsburgh. Laminations are blanked from sheets of silicon steel, mill annealed, between .017" and .019" thick.

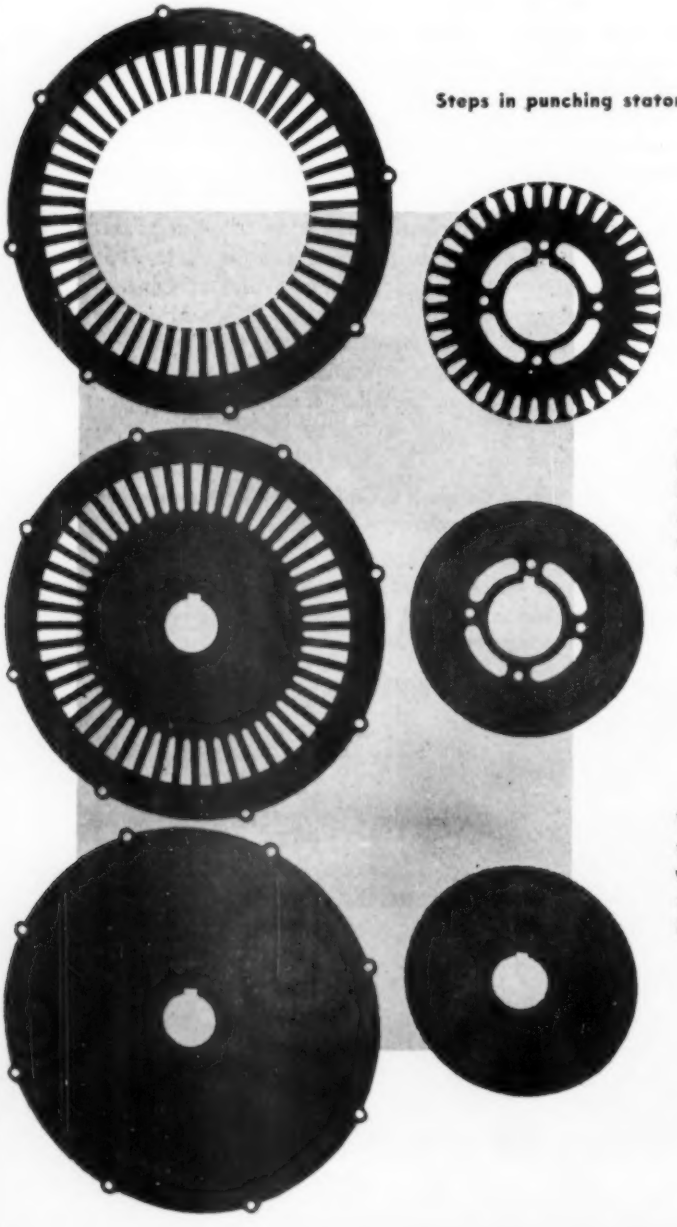
Production of special design motors is classified as low activity, in that as few as two or three may be built to a particular specification. However, manufacture of the laminations for a complete rotor or stator, particularly with regard to the slotting operation, approaches high production as related to other parts production to special design. A few figures illustrate this point.

There are 58 laminations to the inch, and a single motor may have from four to ten inches of laminations for the stator and an equal amount for the rotor. The number of slots ranges between 24 and 96 per lamination. Related to high activity operations, however, the production requirement does not approach that for standard design motors.

A few facts on the high activity method offer an interesting point of view from which to consider the problems of special design manufacture.

On high activity, 60,000 to 90,000 laminations are produced on an average run. High-speed steel, compound dies, are used to produce all the slots in one lamination in a single stroke. Obviously, the indexing press is used on low activity work in that production on any single design for an order of three or four motors does not warrant a $3,000 expenditure for a compound die.

About 90 per cent of the special design requirements have been classified, and several hundred die styles have been produced for the purpose of slotting laminations. There are 12 standard dimensions for diameters, shaft holes, rivet holes and kidney vents for rotors and stators.



Steps in punching stator and rotor laminations.

Vertical row, left, the blank made from strip, blank as punched on indexing press, and the finished laminations with center removed.

Vertical row, right, center punched out to provide semi-standard rotor stock, and index notching to a special design.

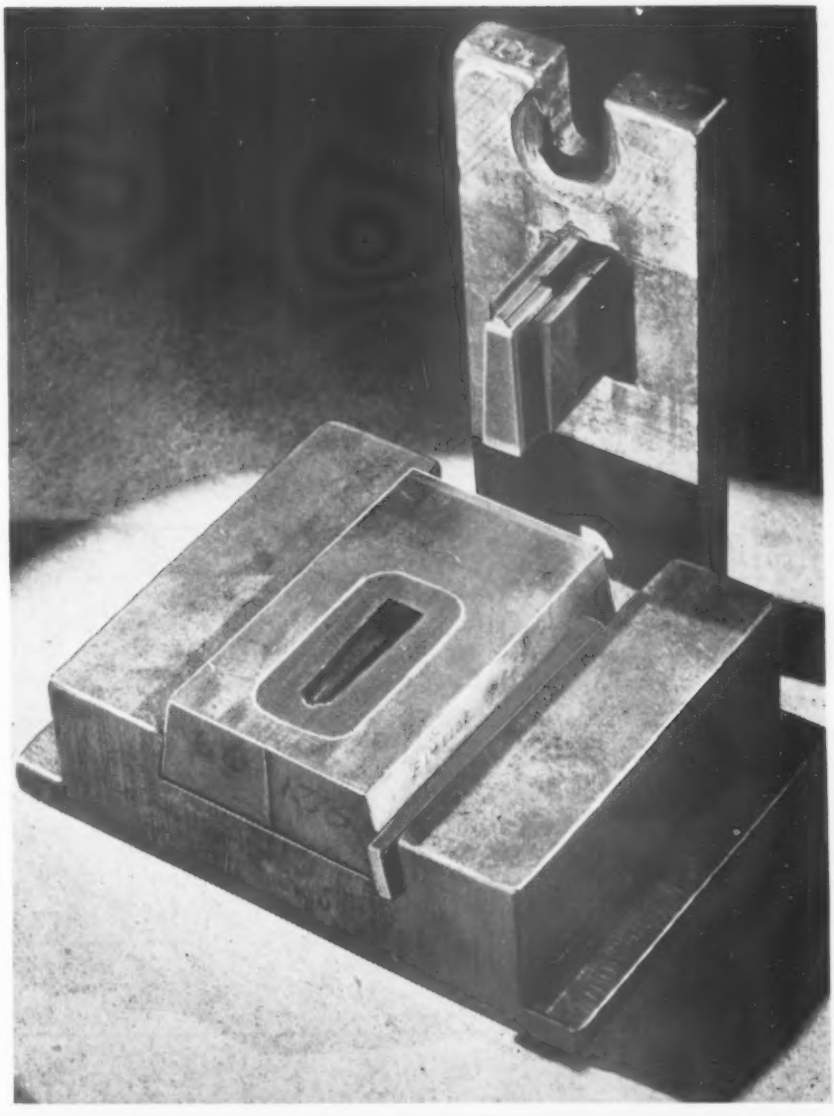
Westinghouse illustrations

Low-cost dies

Selection of one of a large number of slot patterns to be imposed on one of these standard blanks is determined by motor requirements. It becomes apparent that though lots may be small, there is a constant demand for several of the hundreds of combinations of laminations for special motors. A battery of indexing presses is busy on this work 24 hours a day.

It is equally apparent that punch and die life, time between grinds, or machine down time caused by changing dies, is an important factor. Though not directly related to production of this part, time is also saved in tool grinding which is reflected in the service of the tool room to other departments in the plant.

Tungsten carbide was selected as the material for the punch and die used on the indexing press as experi-



Male and female parts of tungsten-carbide tipped dies used for punching laminations. Shaded portion of die clearly shows tungsten-carbide insert.

ments showed that tool life between grinds was five to eight times greater with carbide than with high speed steel. Further, tungsten-carbide dies only cost $75 to $100. Since operation speed was identical with either type of material, die life and initial die cost were the essential factors influencing the selection of tungsten-carbide.

Machine speed, depending upon the weight of the lamination and its circumference, and index spacing or length of travel of the work per punch stroke, is 300 to 700 strokes per minute. Women are operating these machines exclusively, at present. Westinghouse development on these machines has resulted in the application of pneumatic force to operate the spindle brakes.

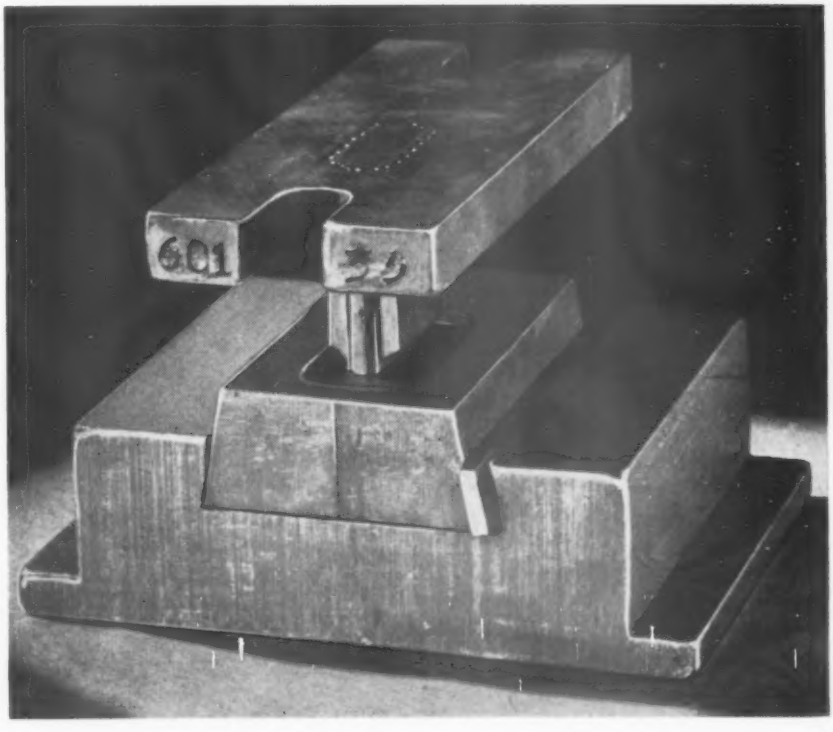
Punch and die design

Important to production of the laminations is that the slot or notch be free of burrs. These parts, in assembly, must lie as flat as possible, one upon the other. Clearance is an important factor here—about .0006″ between punch and die being considered correct for the thickness of the sheet involved. Punch and die are ground to size, entirely, on a formed diamond wheel. Shearing to fit is not practicable with tungsten carbide.

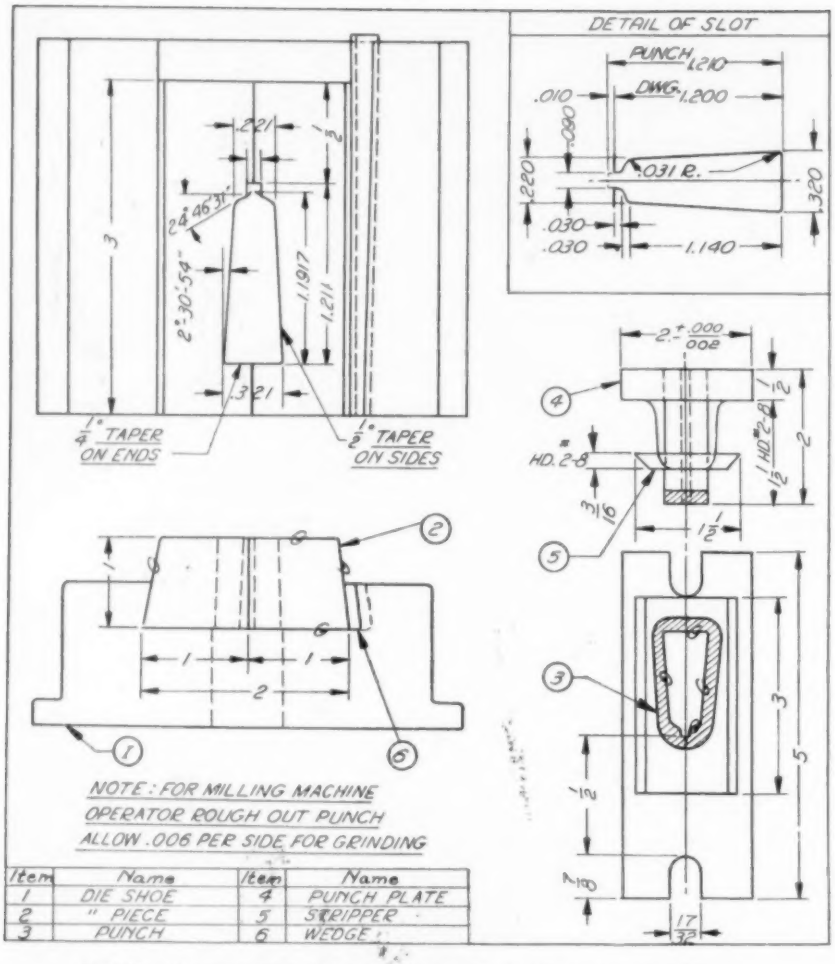
Carbide facing is ¼″ thick on the die part—¾″ on the punch, backed by a good grade of ground steel. High speed steel dies are built entirely from this critical material. The carbide-tipped punch differs from the high-speed steel in that it is reinforced slightly to steady the tool against shock and impact. The die is inserted in what might be termed an auxiliary die set, and is split to facilitate grinding.

A rubber stripper is used because of its simplicity as well as because of the high speed at which the punch operates.

A mixture of Elaine oil and benzine has proved satisfactory for lubricating the workpiece. It evaporates quickly, yet provides the minimum



Tungsten-carbide tipped single-slot die for punching slots in laminations. Male and female parts shown engaged.



Item	Name	Item	Name
1	DIE SHOE	4	PUNCH PLATE
2	" PIECE	5	STRIPPER
3	PUNCH	6	WEDGE

Details of single-slot die used for rotor and stator punchings.

lubrication required for this type of work. The operator applies it with a brush, generally "painting" one half of the circular lamination and permitting the rubber stripper to spread the mixture over the other half.

Overall tolerances

Tolerance on distance between the first and final slots on the circumference of a lamination is held as closely as possible. Generally, it is within .004". The importance of maintaining these limits lies in the need for nearly perfect alignment of the slots of all the laminations after they are stacked for assembly in the motor. Misalignment results in winding failure of the coils which are wound through the slots, in that a projecting edge will cut through the insulation of the coils.

Because the initial punching on the index is located from a marker related to a key on the shaft hole, a slight leeway is permissible. By keying the starting point, slight accumulated error or deviations caused by inaccurate indexing will be the same for all final slots or punchings in a lot. They will thus occur congruently in a vertical line through the entire thickness of a rotor or a stator, so that edges will not project.

MACHINING ARMOR PLATE

ARMOR PLATE is difficult to machine because it is hard and tough. According to engineering data by the National Twist Drill & Tool Company, it responds to regular twist drills and milling cutters made from standard high speed steels. However, because of work hardening, cutting technique differs from that used on ordinary steels.

Areas adjoining flame cut sections harden so that machining is extremely difficult. Annealing such areas is advisable before machining. Where impractical, reduced cutting speeds is the only other solution. Speeds as low as 15 surface feet per minute may be necessary.

Because the tool should cut continuously, positive power feed is recommended. If the tool idles and rubs, the surface work hardens so that it is practically impossible to re-start the cut in that particular spot. Work hardening may also develop from too light a feed. A medium heavy feed, of uniform rate, proves most satisfactory.

On laminar type armor plate—one side harder than the other—drilling should start from the hard side.

Tool sharpening is important. Cutting edges must be well supported. Clearance should be sufficient to clear the work. Rake is advantageous, but should be moderate to prevent weakening of cutting edges. Finish of cutting edges should be smooth as possible and free from the slightest evidence of wheel burn, which creates invisible hairline cracks that result in early failure.

Twist drills for armor plate should be sharpened to an included angle of 135° to 140°, a clearance angle of 6° to 8° at the periphery, and a chisel point angle of 115° to 125°. Milling cutters should have a primary clearance of 3° to 4°. Secondary clearance should be as moderate as possible for maximum cutting edge support.

CUTTING SPEEDS vary widely with material and operating conditions. Drilling speeds ordinarily range from 40 to 50 sfpm. for shallow holes. This must be reduced for deeper holes to obtain reasonable tool life. Milling speeds vary even more with widths and depths of cuts. Speeds as low as 15 and as high as 80 sfpm are recorded. Average speeds range the same as for drilling.

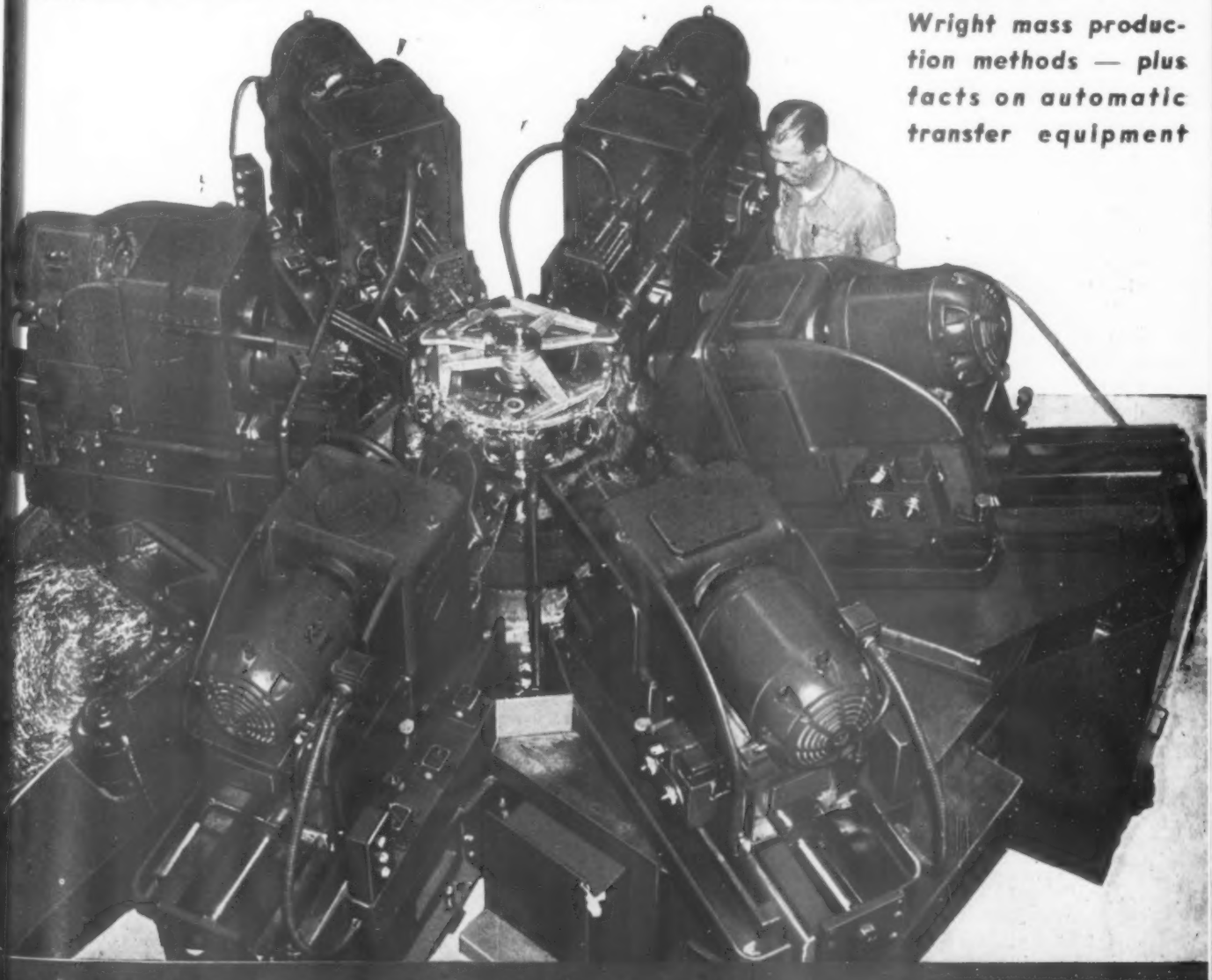
Feeds should be 15 to 25 per cent less than recommended for ordinary steels; though the remedy for cutting difficulties is reduced speeds rather than feeds.

A large volume of coolant should be used at the point of contact between tool and work—sulphurized mineral oil if possible, otherwise an 8 to 1 mixture of soluble oil. Successful armor plate machining finally depends on rigid machines, fixtures and tool holders, to prevent "riding" and subsequent work hardening.

PRODUCTION

HIGH PRODUCTION OF PLANE ENGINES IS ACHIEVED WITH SPECTACULAR SAVINGS IN MEN, MATERIALS AND MACHINES THROUGH USE OF SPECIAL PURPOSE MACHINE TOOLS

Wright mass production methods — plus facts on automatic transfer equipment



Streamlined

IF a single factor could be selected as responsible for production increases made by the Wright Aeronautical Corporation, it would undoubtedly be the design and use of special purpose, high production machine tools.

Many production engineers are familiar with the outstanding example of this type of tooling in the Wright plants, the Greenlee Automatic Transfer Machine. This machine drills, reams, countersinks and taps all holes in a Cyclone cylinder head at the rate of one part completed every 50 seconds.

The 42 individual machines once used to perform the tremendous number of operations required on the cylinder head had speeded actual machining over previous methods, but loading and unloading still consumed more time than that required by machining.

For example, though two Natco multi-spindle drilling machines had

Special Machine Tools

MILLING FORGED CYLINDER HEAD

FORGING cylinder heads has necessitated machining the cooling fins, which obviously could not be produced in the forging process. They had been cast with high accuracy and only a minor clean-up job had been required. However, the milling operation is now performed with equipment which does about everything but push its own start and stop buttons.

Automatic fixtures to guide the milling saws—space between fins is .112″; thickness ranges between .052″ and .068″—were developed by Wright production engineers and Cincinnati Milling. Special adaptations of Hydrotel equipment were designed for cutting the fins across the dome of the cylinder head.

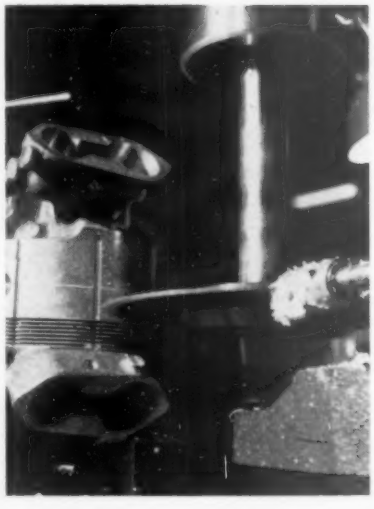
Two spindles, with 13″ saws mounted on each, operate simultaneously on separate set-ups of parts clamped to two rotary tables—four heads to each table. Tables index each part so that four identical fins are cut on all heads before the cam follower indexes to the next position for contour control. Cams are located on a third table which controls both spindles. Feed of 70″ per minute is developed during cutting, but this is stepped up to 250 feet per minute between indexing the heads. Varying depths of fins range as high as 2¾″.

STOPPING CUTTER VIBRATION

A similar development of Hydrotel equipment is used in cutting the fins circling the sides of the dome. The chief value of the fixture may be said to lie in control of the arbor movement through the cams and standard hydraulic accessories.

The fins which encompass the lower portion of the cylinder head are milled on Cincinnati Hydromatic machines. Cam control of the cutters, same as employed on the fixtures described above, provides for contour control and indexing.

A rather unusual problem was met in design of the cutters used on these jobs. Thirteen inches in diameter, as mentioned, they are .112 inches thick, that being the



Special Cincinnati Hydro-tel machines cut fins in exhaust port section of a forged head.

Wright Aeronautical photos

Close-up of milling fins on dome section. Note tallow applied to cutting saw to provide lubrication.

Production

replaced 10 single spindle presses, incorporation of the improved machining process in the automatic transfer machine effected even greater savings.

Emphasis on special machines has been logical in that aircraft engine manufacturers have not many roads to take in streamlining production. That's because of all combat items, none is designed with more care and finality than the aircraft engine. Changes in shape or size of a part to facilitate production are seldom if ever made.

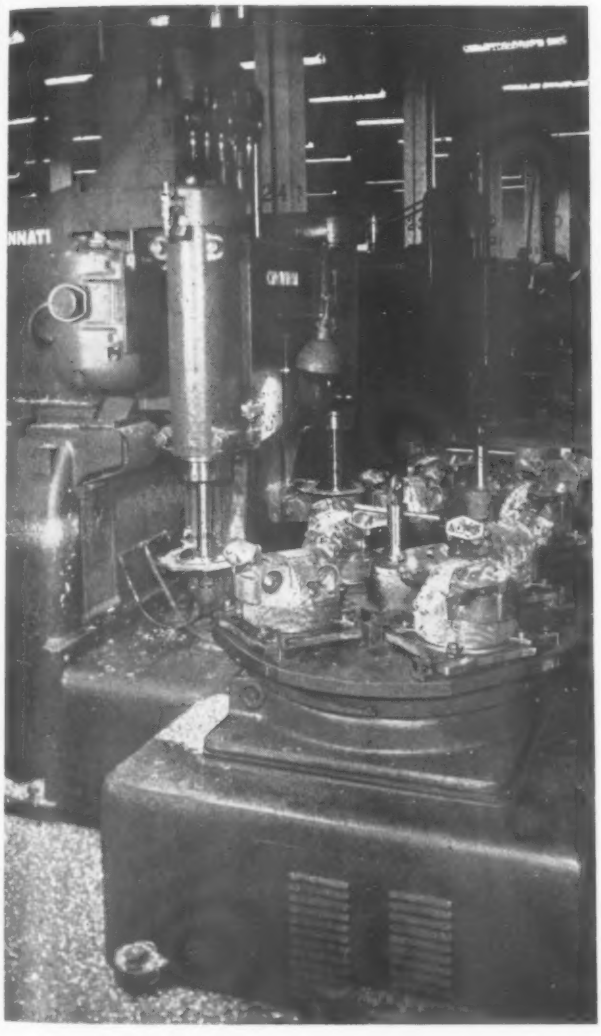
This condition does not reflect in the least on the interest of the designers in the production man's job. The point of the matter is that design must come first.

Therefore, with a set specification to build to, production engineers interested in conserving manhours and machining time look only to the production equipment itself as far as changes are concerned. At the Wright plants, they have not closed their eyes to small details. The method of cleaning aluminum chips from a machine, described on a following page, illustrates this point. But, the spectacular increases have resulted largely from the use of special equipment.

In this article, some of the more interesting production problems are presented as completely as space and estimated reader interest permit. Others are treated entirely from the results angle, by outlining in as few words as possible, what steps were taken and what was accomplished.

One production improvement has resulted in a better product. That is the change from casting to forging cylinder heads.

Boost Engine Production



Special machines operate two spindles with 13" saws mounted on each. Cutters operate simultaneously on separate set-ups of parts clamped to two rotary indexing tables.

distance between fins. This means that they are actually thicker than the fins themselves. One of the first problems encountered was that of cutter vibration. As they were drawn out of the cut, their vibration excited the fins to the breaking point. A little study of harmonic frequencies was necessary before designing a cutter which lacked resonance, or vibratory qualities.

Cutters operate at 4500 surface feet per minute. Pumping coolant into the nine carbide tipped teeth on each cutter revolving at this speed, just added to the oil film in the shop. Peculiarly, such coolant as did manage to cling seemed to have an abrasive action on the teeth. However, a little tallow, fed into the teeth from a slotted nozzle through which the teeth pass, provides sufficient lubrication. No unusual heating of the work is experienced.

One more interesting accessory to this operation is the vacuum system which pulls the chips out approximately as fast as they are produced.

ADVANTAGES OF FORGED HEAD

Reviewing the whole job of producing cylinder heads, forging has not only resulted in producing a stronger head, but milling the fins permits thinner fins and more of them. This makes for better dissipation of heat. Further, forging, rough and finish is done in about three minutes, whereas casting required forty minutes. The milling operations are performed well within this differential.

One interesting job which followed casting was the manner of cleaning up fins. A band saw blade was run between the fins backwards, the teeth serving to knock off any imperfections. In that they did not present a cutting edge to the work, danger of gouging or biting into a fin was eliminated.

Incidentally, heads for spares—replacements for engines of previous design—are still cast. In fact almost all replaced methods described in this article, are still in use on this type of production. Streamlining thus improves new production and releases equipment for spare aircraft engines which are becoming more and more important as the toll of battle mounts.

Streamlined Production

SUPERCHARGER FRONT SECTION

MACHINING OPERATIONS on the supercharger front section of the Wright Cyclone engine make extensive use of special equipment. Two machines, in one instance, replaced seven, and reduced or saved more than 121 man-hours per three hour shift.

The first of these machines, is a six-way Greenlee horizontal and angular, 14-station, automatic indexing machine. It rough and finish bores, faces and drills radial holes in the part. At the first loading, this machine rough faces and bores 14 intake parts and seven mounting pads, and rough bores three holes in the oil sump pad.

At the second loading, after changing three tools, it finish faces and bores the 14 intake ports, finish bores and reams the seven mounting pads, drills four holes in two breather pads, drills two holes in each of the seven mounting pads and bores and drills three holes in the oil sump pad.

MACHINING THE MAIN BEARING

• The main bearing of crankshaft center sections is machined on Wickes Crankshaft Lathes, designed especially for this purpose. The double-end drive assures a high degree of accuracy, and the simplicity of operation combined with reduced handling, results in substantial savings.

Two 24" lathes
24.1 man hours per 3 shifts
519 square feet of floor space

saved by STREAMLINED PRODUCTION

The second machine—an eight-way horizontal and angular 14-station, automatic indexing machine, finish reams, chamfers and taps radial holes in supercharger front housings. It finish reams, countersinks and taps all the holes produced on the first machine.

Equipment replaced by these two machines includes five radial drills, one radial tapper and one vertical mill with rotary table. Five handling operations are eliminated and 17 men per three shift day can be employed at other operations.

Pre-Set-Ups

On a straight turning operation on the supercharger front section, Wright production engineers developed a set-up jig or target for accurately locating the unwieldy workpiece on a duplicate face plate, while the lathe was in operation on another piece.

The machine, a Foster Fastermatic, performs a straight turning operation on both I.D. and O.D. The machining job itself is quite conventional, but the set-up operation as now performed is worth study. Previously, set-up time was about as time-consuming as machining on the lathe.

The problem was to target the work precisely so that the first cut on the I.D. left sufficient material for cleaning up the O.D. Obviously, this requirement was made in order to maintain a specified wall thickness.

Commonly, the set-up was performed on the vertical surface plate on the lathe, by means of bluing and scribing. Never too accurate a method, this manner of set-up also tied up the machine.

Using the present method, with the duplicate plate in a horizontal position, set-up is performed more accurately, and locating devices can be employed which did not lend themselves to the vertical set-up.

In addition to the use of pins and dogs, on the face plate, a temporary positioning jig can be laid over the top of the work to assist in accurate location.

ROUGH BORING, FORMING AND FINISH REAMING

• A machine was designed to roughbore, form a stepped hole, and finish ream starter shafts.

3 turret lathes
59.2 man hours per 3 shifts
452 square feet of floor space

saved by STREAMLINED PRODUCTION

Painting and Spraying

Automatic conveyors carry supercharger front sections and other parts through the paint spray booths for the priming coat, and then into the baking ovens. Without additional handling, the parts then pass through two finishing paint booths and baking ovens.

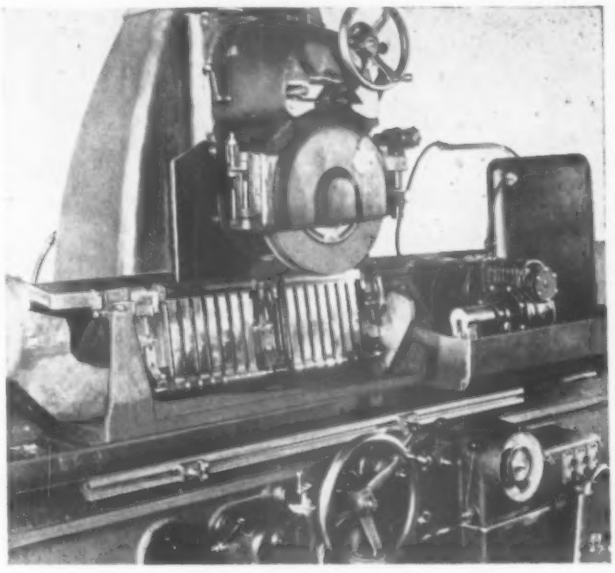
Whether operations are machining or painting, attention is given the problem of making the fullest use of the equipment involved, by reducing handling time which subtracts from machining time.

MECHANICAL OSCILLATOR FOR GRINDING

• A power-driven oscillating fixture built on to a Mattison grinder causes the articulated rods to rock back and forth under the concave edge of the grinding wheel. As opposed to the former method of hand oscillation, with dry disc grinding, wet grinding eliminates burning of the metal, reduces scrap, improves the quality of parts through more uniform presentation to the grinding wheel.

2 disc grinders
1 polishing jack
123.8 man hours per 3 shifts
133 square feet of floor space

saved by STREAMLINED PRODUCTION



AIR GAGE

IN JULY, THE TOOL ENGINEER acquainted its readers with the amazing accuracy of the "air gage," a device for measuring or checking inner and outer diameters on certain parts more accurately and faster than was possible with other methods.

Wright Aeronautical has made excellent use of this measuring device in checking lead-plated silver bearings on the master connecting rod. These bearings have a .001″ plating of lead, with a flash plating of indium—about four per cent of the amount of lead used—in that lead will corrode in contact with lubricating oil acids, unless alloyed with indium. The indium is diffused with the lead in a hot oil bath—340° F.—because the alloy itself will not plate.

However, the point toward which this description leads is that this bearing is so soft that to touch it with fingers will leave a burnish mark. Yet the part must be inspected, and tolerance permits an overall leeway of only .0005″. If the gage cannot touch the part, there is only one method accurate enough to properly inspect it, and that is air gaging.

Air gages are simple devices, not required to be overly accurate in themselves, in that they do not come in contact with the part being inspected. They serve to permit the escape of air within an internal diameter of a part which surrounds the outer diameter of the gage. The difference in the rate of flow between the gaging position and in the open air can be measured. A range of known rate flow can be computed in 10/1000ths of an inch on a pressure meter. A tolerance range for any specified diameter can be quickly determined by checking the gage with a master ring or plug gage.

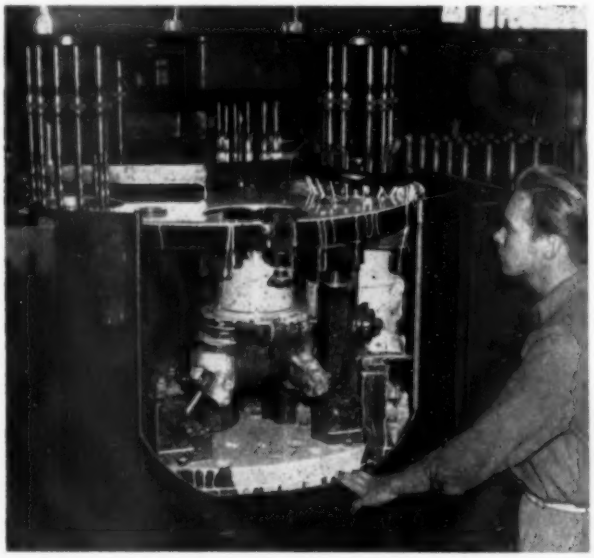
Air gage permits precision inspection without touching part.

MATERIALS

IN two instances Wright engineers have been able to substitute for aluminum in parts manufacture. Baffles around cylinders and push rod housings are now being produced from a thermo-setting resin. The push rod housings were manufactured from thin-walled aluminum tubing, approximately 15″ long and 1″ in diameter—with 28 such parts to each engine.

More important was the substitution of plastic for aluminum in construction of baffles which deflect air around the back and over the top of cylinders.

Previously stamped from sheet aluminum, about 8″ by 8″ by 1/32″, these were blanked, formed, anodized and painted. Now an outside supplier produces them from impregnated cloth with one stroke of the press. A vital material and many man-hours were conserved.



DRILLS AND REAMS TO SIZE ➡

• A Rehnberg-Jacobson specially designed machine drills four locking pin holes in the two spark plug bushings with the left-hand drill heads, reams them to size with the right-hand heads.

8 single-spindle drill presses
178.8 man hours per 3 shifts
561 square feet of floor space

saved by STREAMLINED PRODUCTION

⬅ FIVE-POSITION MULTI-SPINDLE DRILL HEADS

• A special five-position Baker drill is used for drilling, reaming, and countersinking the twenty hold-down screw holes in the flange of the cylinder assemblies.

3 special drill presses
2 single-spindle drill presses
85.5 man hours per 3 shifts
585 square feet of floor space

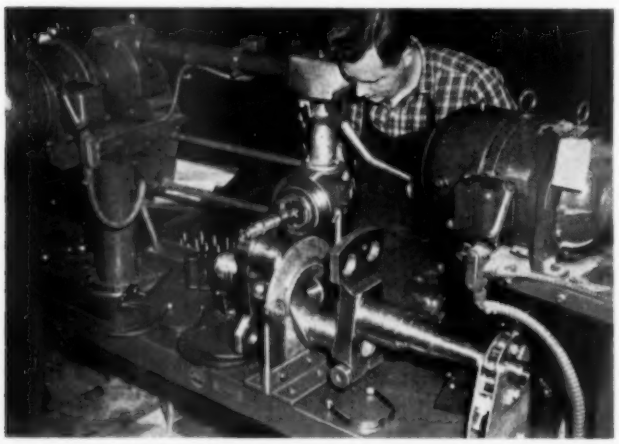
saved by STREAMLINED PRODUCTION

TORQUE MACHINES

SAVINGS in manhours and materials have resulted from reduction of scrapped parts previously caused by a lack of accurate control in driving certain studs and tightening bolts.

The savings have been effected by the use of Scandia torque machines which can be pre-set so that the clutch will slip or disengage upon application of tension above that desired. In one application, crankshaft clamping bolts must be tightened until they have stretched .009". When done by hand, an eight foot wrench was used, which presented certain obvious handicaps to the operator interested in accurately gaging tension. The torque machine does the job faster, and stretches the part to a precise fit.

The same type of equipment also is used to lap the female thread for this bolt. This thread is in the lugs, which with the clamping bolt, bring together the split cheeks of the crankshaft around the pin that passes through the one piece master connecting rod.



In tightening the clamping bolts, the threads tended to pick up under tension. Lapping the threads was tried unsuccessfully. It was then realized that as the lugs were brought together they were distorted from true alignment in that they tended to move through an arc. Proper lapping, therefore, required that the distortion be simulated during lapping so that a surface could be developed in relation to the alignment or misalignment, which resulted from tightening the bolts.

With a dummy crankpin in position, the lapping or burnishing tool is manually tightened into the lugs and then a power drive from the torque machine is hooked on. The lapping tool, acting just as the clamping bolt would, pulls the lugs out of alignment. When the specified tension is reached, the clutch disengages. The lugs, however, are held in distortion by a stop backed by a heavy compression spring. The lapping tool is then able to back out freely and to pass back and forth freely until the proper surface is developed.

Streamlined Production

CONVEYORS

CONVEYORS, both roller and power types, have done much to simplify and speed the handling of heavy parts, particularly by women workers. At the same time, they have effected large savings in floor space by eliminating the usual temporary storage at each machine of large numbers of parts in process. Areas normally required for this purpose can be occupied by productive machines. This saving, coupled with that effected through the use of a smaller number of machines made possible the erection of a smaller plant than would otherwise have been required. The smaller plant, with its more compact machine lines, in turn, demands less supervision, fewer lead and set-up men.

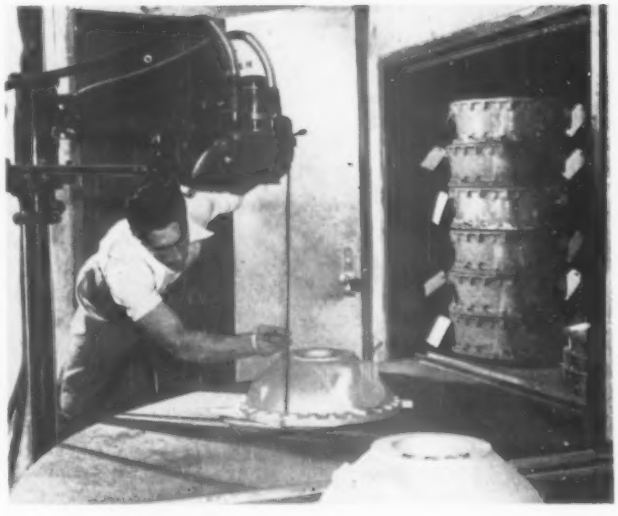
COOLANT CLEANS CHIPS OFF MACHINE

ON some machining operations, fine aluminum chips are produced which cannot be efficiently cleaned off the machine with compressed air. They blow everywhere but in the direction selected by the operator. Now, a stream of coolant washes them away for salvage recovery. Coolant is also recovered and recirculated.

NEW USE FOR MERRY-GO-ROUND

ONE of the most interesting developments of mass production is the adaptation of pre-set-up jigs and fixtures which have made ordinarily time consuming processes take place more rapidly. Such set-ups are familiar to most production engineers, yet there undoubtedly remains in many plants and shops some room for more of these applications. It is not unusual, with many types of production operations, to have set-up time require more time than the actual job on the machine.

Streamlined Production



In X-raying the front section of an airplane engine, set-up time has required approximately three to four times the period required for exposure to the X-ray machine. Valuable equipment was therefore idle as much as 75 per cent of the time. Wright engineers devised a circular table, riding on rollers, with a quadrant section always within the lead-lined X-ray chamber. X-ray equipment is busy all the time, for front sections, completely set-up for exposure are always available.

Lead-lined sliding doors close across the table surface while the machine is in operation.

SPOT FACING SPARK PLUG BUSHINGS

• A special Snyder machine carries hydraulically-fed back spot facing cutters on the body of the work-holding fixture, and is used for chamfering and spherical back spot facing spark plug bushings.

Five 2-spindle drills
94.4 man hours per 3 shifts
385 square feet of floor space

saved by *STREAMLINED PRODUCTION*

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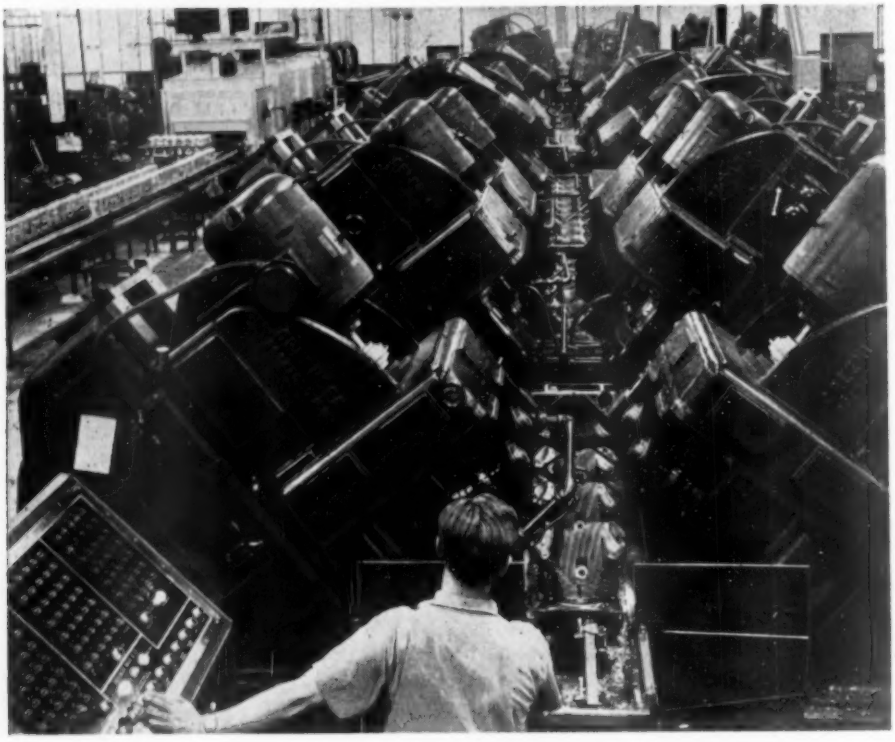
Though the special machine shown at the right requires one more handling operation in completing the job to be done, 12 less men are needed per three shift day.

Streamlined Production



Automatic handling cuts manpower needs, produces complete head and barrel assembly

FIGURE 1. Special machine is one of the automobile industry's contributions to mass production of aircraft engines.

The complete machine is more than 175 feet long and has 50 operating stations. All told, it has 162 tools, automatically operated.

Studebaker Corporation photo

Transfer Machines Speed Engine Output

• Automatic transfer machines are not new ideas to Tool Engineer readers. In the issue for March, 1942, one used by the Wright Aeronautical Corporation was described. However, more stations have been added to the equipment used by Wright and Studebaker, and present emphasis on increasing production, with less men, materials and machines makes this presentation fitting.

IF, in times of peace, all automobiles were made alike, the price of a car would be considerably less. Cylinder block lines, final assembly lines and other parts of the shop could be invested with features of automacity not warranted by demand for any one make or model.

The degree to which engineering ingenuity has advanced automatic operations has been clearly exemplified by methods now used in machining airplane engines. Tremendous demand, occasioned by war, has made highly automatic machines a sound investment.

The continuous operation idea has been applied in the design and building of huge, multiple-station transfer machines now operating at plants of the Studebaker Corporation and the Wright Aeronautical Corporation. They were built by Greenlee Brothers & Company.

These machines automatically transfer work from one station to the other on the composite machines throughout the entire line. Figure 1, shows one of the largest of these machines as used by Studebaker. The multiplicity of work stations permits operations on both front and rear cylinder heads, before the barrels are assembled to the heads. Figure 2 shows another and smaller transfer machine used for machining cylinder heads and barrels as assembled together. Three sections of this equipment are located adjacently at Studebaker, and their aggregate length is 175 feet.

A schedule of machine and electrical specifications, as they cover the three machine units, is detailed in Figure 3.

FIGURE 3.

MACHINE SPECIFICATIONS	UNIT NO. 1	UNIT NO. 2	UNIT NO. 3	TOTAL
TOOLS	49	97	8	154 TOOLS
OPERATIONS	64	123	26	213 OPERATIONS
WORKING STATIONS	14	37	8	59 WORK STATIONS
IDLE STATIONS	17	36	11	64 IDLE STATIONS
INSPECTION STATIONS	3	6	1	10 INSPECTION STATIONS
TOTAL NUMBER OF STATIONS	34	79	20	133 STATIONS
LENGTH	43' 1½"	102'7"	28'½"	174 FEET
CUTTING COMPOUND	550 GALLONS PER MINUTE	550	200	1300 GALLONS
ELECTRICAL SPECIFICATIONS				
MOTORS	21	39	6	66 MOTORS
LENGTH OF WIRE IN MILES	6¾	16	2½	25¼ MILES
LIMIT SWITCHES	93	210	32	335 SWITCHES
INDICATING LIGHTS	49	120	26	195 LIGHTS
CONTACTORS, TIMERS, RELAYS	104	221	48	373 PIECES
PUSH BUTTONS AND SELECTORS	56	91	28	175 PUSH BUTTONS

A few of the tools used are of composite type, which accounts for slight discrepancies between the schedule furnished by design engineering and the captions beneath Figures 1 and 2.

Figure 4 shows a portion of the transfer-type conveyor, the coolant pipes and the composite toolheads, as used in the Cincinnati plant of the Wright Aeronautical Corporation. Figure 5, a close-up, shows how gages are built into the machines to test work alignment and accuracy.

To provide room for operators to watch the work, many idle stations are incorporated between the various machine units. Idle space, however, has no effect on production once the machine is full and is delivering cylinder heads. The longest time required for any single operation governs the time required to finish each piece.

To achieve positive location required for a high degree of accuracy at each station, the engine heads are first subjected to preliminary turning and boring operations. These provide an accurate seat for the special carrier plates on which the heads are mounted before loading into the transfer machines. Carrier plates have dowel holes provided in their under surfaces, and as the plate with the mounted cylinder head is transferred to a working position, hydraulic clamping platens arise automatically and in proper time from below.

Clamping platens carry dowels which engage the dowel holes in the under sides of the work carrier plates, and in this way, the plate with its mounted cylinder head is positively located and also clamped. The toolheads then advance to the work automatically (at some stations from both sides, at others from one side only), perform their particular operation, and then retreat. The work is then automatically unclamped, and the entire string of work units moves forward one station.

Operations involved include drilling, reaming, boring, facing and tapping operations. Machines are all of the way type so that tools advance in an absolutely straight line. All heads advance to the work by hydraulic action, with the single exception of tapping tools. To obtain correct lead on these units, they are advanced by means of lead screws. All motions are controlled primarily by electricity. Electrical specifications in Figure 3 reveal the tremendous amount of wiring and other electrical equipment necessary for one of these machines.

Units are so interlocked, electrically, that in case anything goes wrong at any of the numerous work stations, the entire machine will automatically become inoperative. All that has to be done to locate the trouble quickly is to press a push-button on the master control panel. On this panel there is a light for each of the work stations, which is on a circuit depending on the functioning of that particular station. Failure of any one of the lights to flash when the button is pressed, shows where trouble has occurred.

Actually, transfer machines are made up of a number of machine units which may be considered individual machines, connected only by the bridging sections of the transfer conveyor line, and by a so-called transfer bar. This is a reciprocating bar, made up in sections, which is operated hydraulically to give one reciprocation for each indexing or transfer of the work pieces. This bar is fitted with latch hooks which operate to carry the carrier plates forward at each forward stroke, but which do not engage on the return stroke.

If a design change is made in engine heads, involving one or more of the machines, at one or more of

Studebaker Corporation photo

FIGURE 2. A number of the final machining operations on the cylinder head and barrel-assembly for Studebaker-built engines are done on this six-station automatic machine.

the work stations, the manner in which the machines are coupled permits the particular machine unit or units to be withdrawn for alteration, or replacement. If necessary, an entirely different unit to drill, ream, or bore at a different angle or different location might supplant the withdrawn unit. Individual machines can also be removed and the series of remaining units hooked up again without removing any already in place.

When one unit is taken away, or another one added, it of course involves moving a number of the units already in line. In this way, machines of this kind can be kept up-to-date without tremendous expense. Whenever such changes are made, of course, they involve taking away or adding sections to the conveyor and to the transfer bar. Such lengths are standard, for the distance between work-stations from one end of the machine to the other is constant.

All operations performed prior to assembling engine heads and barrels are not done on one machine, because many of the holes are drilled, bored, or reamed at right angles to others. Therefore, it is most convenient to route the heads through one machine which can do all of the machining that can be consistently done on opposite sides of the heads, without incorporating any rotary indexing of the heads. When the heads are delivered off the end of the first machine, they go through a washing operation to remove chips and foreign matter. Upon loading into the second transfer machine, they are turned 90° from the position they occupied in the first machine. Traversing the second machine in this position, work is accomplished which would be impossible in the first machine without rotary indexing.

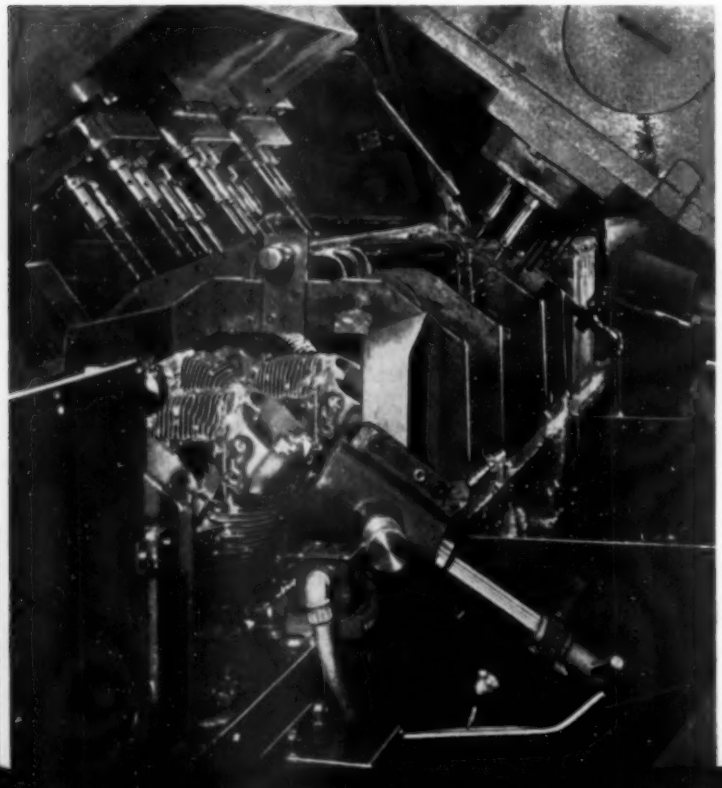
The same proposition holds in smaller measure in machining aluminum heads and the barrels after they have been assembled. In this case, however, there is so little work to be done in one of the two directions, that it can be accomplished with units stationed at the loading and delivery ends of the final machine.

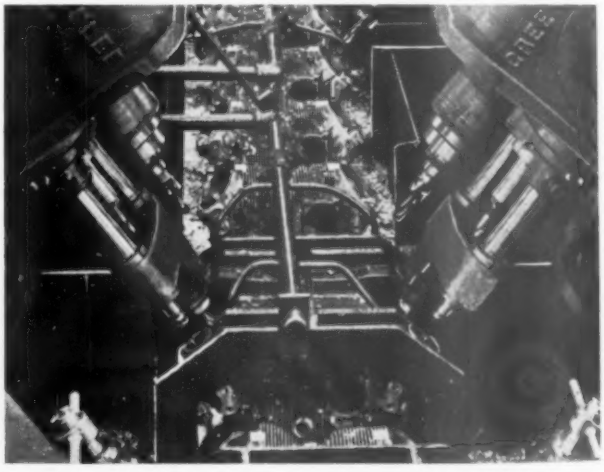
These transfer machines are so designed that the machine units are incorporated to do all of the machining necessary, in either a front or rear engine head. (There is some difference between the two.) Consequently, the machine is arranged to run front engine heads over a span of time, after which it is changed over for rear heads, merely by pushing certain buttons on the control panel. When front engine heads are being run, certain units that have reference to rear heads only are rendered inoperative. When rear heads are being run, these units are thrown back into service, and certain machines that have reference to front heads only are idle.

Obviously, down-time on a machine of this character is serious. So that the fullest possible use may be made of working time, all units are carefully tooled. Except for the taps and smaller diameter tools that can be replaced quickly, all of the tools used are tipped with carbide. Careful attention has been given to the design of the machine, so that tools will have a minimum of overhang, and spindles of large and rigid type have been used to minimize deflection.

On tranasfer machines installed in certain plants of the Wright Aeronautical Corporation, a number of milling operations are performed in addition to the operations of drilling, reaming and tapping. A short section has also been added to the rear end of one machine, through which the cylinder heads travel in an inverted position, to permit machining valve seat counterbores that cannot be machined from the outside of the head.

It must not be supposed, of course, that because mention was made of turning the workpieces through 90° in changing them from one transfer machine to another, that only such holes as are perpendicular to the path of travel can be machined. Some units in these machines work at a compound angle with the line of travel. THE END

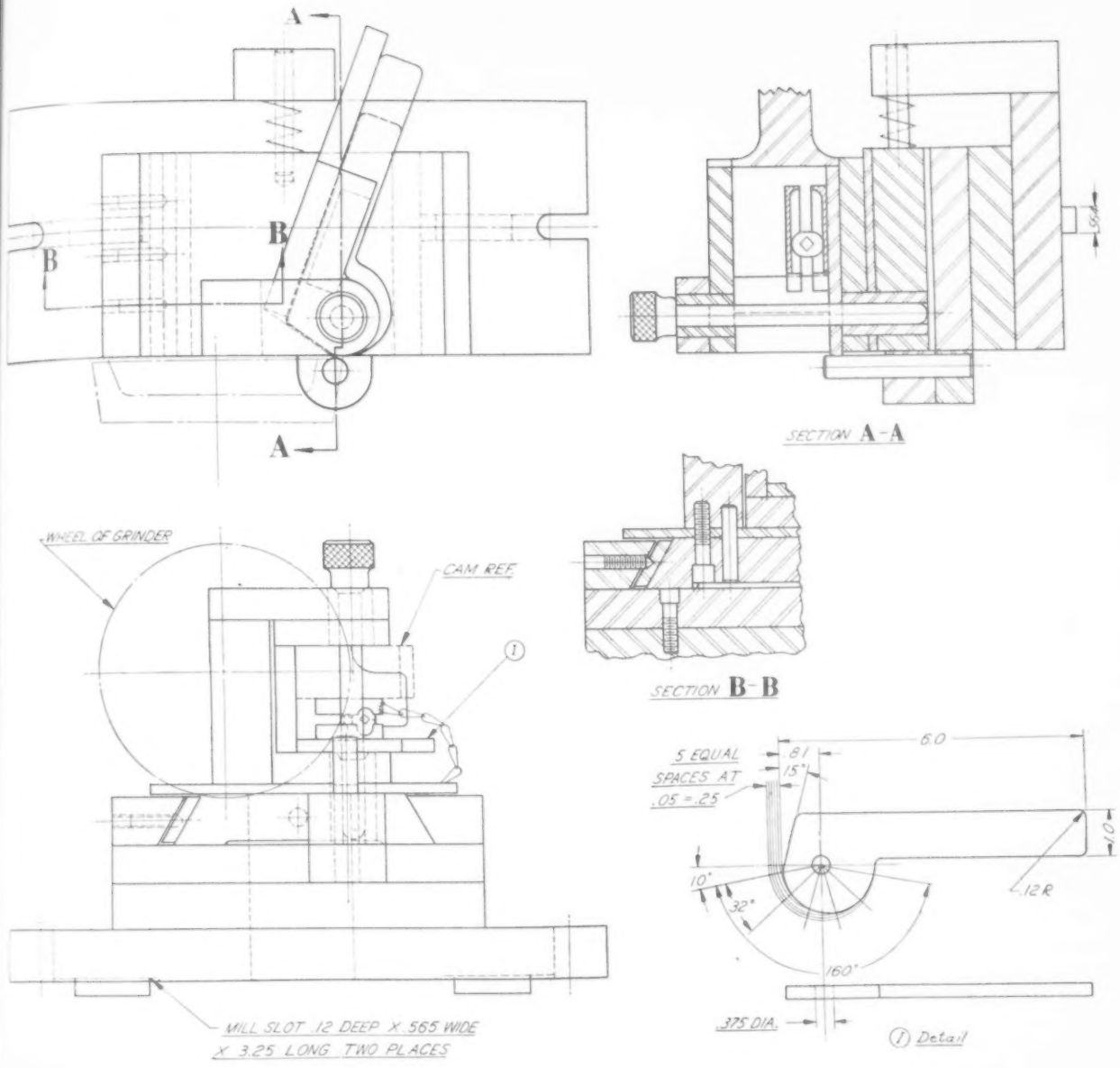




***Above*—FIGURE 4. Portion of transfer-type conveyor, showing coolant pipes and composite toolheads.**

Wright Aeronautical photos

FIGURE 5. Gages are built into the machines to test work alignment and accuracy.



Simple Profile Grinding Fixture Solves Cam Production Problem

LLOYD L. WEST

AIRCRAFT MANUFACTURERS experiencing difficulty with cam-actuated clamps on heavier jigs and fixtures, frequently can trace their trouble to the tool shop. Many experienced tool makers are not able, or will not take the time, to lay out and finish a cam correctly.

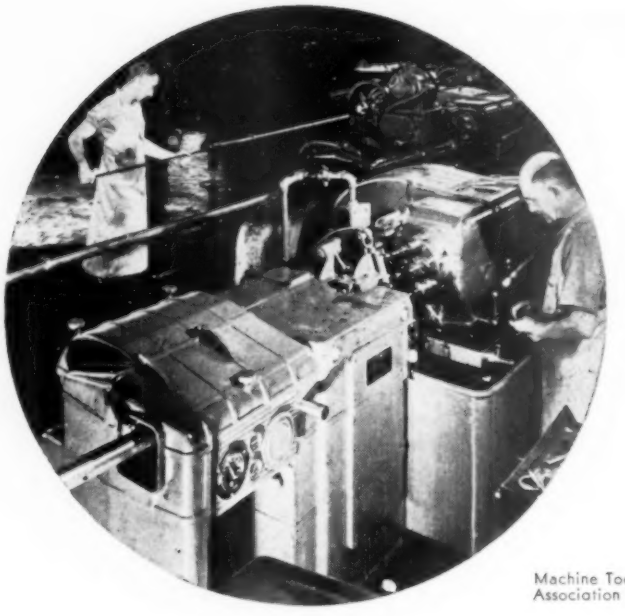
To circumvent this condition, a simple profile grinding fixture was designed, as shown above, and put into use. Detail 1 shows a template correctly laid out for a spiral curve on the cam surface. Any desired number of these templates may be made (preferably by experienced template makers) for various sizes and types of cams. The template includes the pivot hole.

Templates are assigned numbers which the tool draftsman may indicate instead of detailing the individual cams on his drawings.

In practice, the tool maker checks out the template indicated on the drawing, together with the profile grinding fixture. He lays the template on the cam material, locates the pivot hole with a transfer punch and scribes around the template for layout. He then saws and machine-files the cam, leaving material on the cam surface area for grinding.

The pivot hole is drilled and reamed, the cam is heat-treated, and then cam and template are set up in the fixture as indicated. It is apparent that, as the lock-up assembly is rotated, the cam surface will be ground to the template contour.

Much of the "know-how" needed in the growing number of automatic screw machine departments concerns tools and attachments for increased efficiency and economy of operation



Machine Tool Builders Association photo

This third article in a series reveals additional broad tooling applications

JOHN E. HYLER

Screw Machine Progress

WAR PRODUCTION has increased tremendously the demand for small parts produced by automatic screw machines. Though more machines are now being operated in more plants, heavy loads and crowded schedules are pushing them to capacity. Need is great for the most efficient operation possible.

Such vital factors affecting efficiency as design of self-opening die heads, burring attachments, bent taps and cut-off tools are discussed in this article, along with information on lubrication, cutting fluid application and motor drives.

Self-opening Die-Heads and Hollow Mills

A relationship between self-opening die-heads and hollow mills is not generally recognized. However, at least one manufacturer of these tools for automatic screw machine use fits many die-heads with multiple circular chasers, and uses the same multiple circular tool idea for self-opening hollow mills.

The principal advantage of using hollow mills of this type is that they cut four chips at one pass, and then open at the end of the cut for a quick getaway from the shoulder, leaving the turned portion absolutely free from cutter marks. In addition to such hollow mills and die-heads, a complete line is offered in both stationary and revolving types for application to automatic screw machines and turret lathes.

Die-heads are made by various firms for automatic screw machines, some of these opening automatically at any pre-determined point. Several firms produce die-heads with special application to B. & S. automatic screw machines. One with circular chasers is arranged so that it is automatically closed just before the threading operation. Compensation is provided in the shank to offset possible variation in tool-slide travel, because of cam wear.

Some suppliers offer die-heads fitted with both adjustable head-end trip and adjustable pull-off trip for use on B. & S. machines. One manufacturer has produced a tool with a floating or buffer action shank that allows it to yield as it starts on the thread. Smooth and uniform engagement is insured eliminating shaving and need for close lead camming. This company also makes a button trip, rotary, self-opening die-head for use on multiple spindle machines.

Machine Provides Burring Attachment

The term "burr" often suggests a knife-like edge that is turned back on metal parts. In automatic screw machine work, however, it refers to a tiny round spur or proturberance in the center of the diameter at the cut-off point. When pieces are left to drop free, they break off under the combined weight of the piece and the pressure of the cut-off tool. Larger pieces, therefore, have a larger burr.

Consequently, grinding, shaving and tumbling operations are frequently needed. However, to avoid the added operations, one firm has equipped a modern five-spindle machine with a special burring attachment enabling it to produce work free from burrs.

The machine is provided with a turret head for carrying end-working tools, as well as with four cross-slides. When desired, the fifth cross-slide may be applied. The special burring attachment is actually a collet or chuck held in an auxiliary, synchronized rotating spindle which is mounted on the turret head and arranged to revolve in the same direction as the work spindles. It is in perfect alignment with the spindle at the cut-off position.

As the piece approaches to be cut off, the auxiliary spindle advances with the turret head, and the collet automatically grasps the part being cut off, supporting it rigidly until the operation is completed. In this way, there can be no deflection of the part, even after it has been cut entirely free from the rod or bar. Therefore the cut-off tool can pass center and produce

a perfectly clean cut.

But this is not the whole story about this special burring attachment. It may be used for performing various operations on the second end of the work which has been cut off, such as drilling, countersinking, and other operations which would ordinarily require a second chucking. Because the work revolves and the tool is stationary, it is possible to hold to close concentricity on such second operations, since a drill or other tool automatically tends to hold to the center of a revolving part.

Application of Die-Heads, Cross-Drilling and Burring Attachments

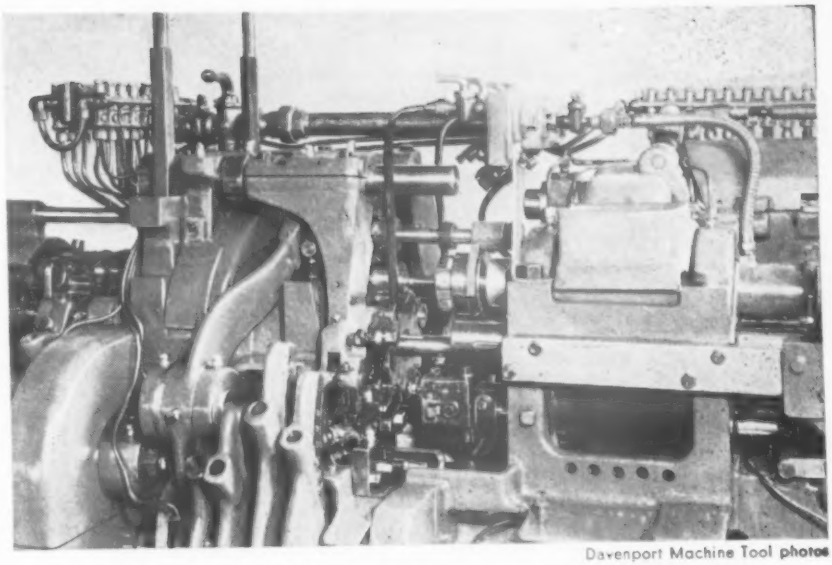
A five-spindle machine is shown in Figure 1 with a die-head in position. A machine of this type has been tooled for the production of Allyne-Zerk steel nipples. An outstanding and unusual layout is shown in Figure 2 in which a cross-drilling attachment is mounted in combination with a fifth cross-slide.

Figure 3 illustrates the operation cycle as performed by one of these five-spindle machines on a special adjusting screw, exemplifying the use of the burring attachment. The cut-off tool provides a chamfer on the end of the following piece, so that a radius may be faced while removing only a minimum of material from the end of the stock.

At "A" the stock is stopped and rough-turned by means of an adjustable hollow mill. At "B" the radius is faced on the end of the screw, and the piece is formed at the head end. At "C" finish turning takes place with a box tool, and at "D" a revolving, self-opening die-head threads the larger diameter of the body. At "E" the auxiliary chuck of the burring attachment is shown in full lines in its ordinary position at the right, while it is shown at the left as having advanced and closed upon the workpiece. This chuck is revolving in the same direction and at the same speed as the spindle "E", therefore the advancing cut-off tool will leave no burr.

In the special internally-threaded bushing detailed at the upper left-hand corner of Figure 4, a more complex condition exists, for it is necessary to provide a 1/32″ by 90° countersink in the cut-off end. This normally could be done only as a second operation, but on this machine, with the attachments provided, it is all done in the same operation.

At "A", the stock is stopped and



Davenport Machine Tool photos

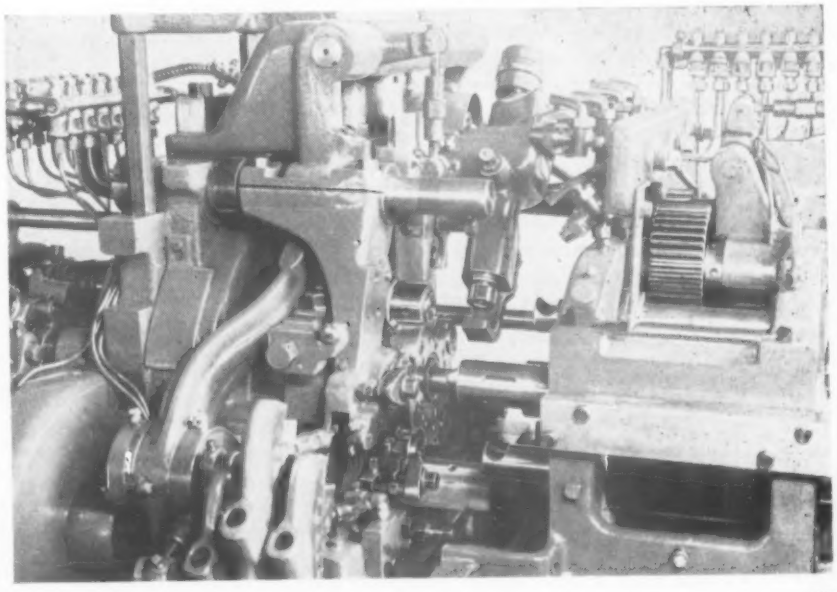
FIGURE 1. Die-head is shown in position on a five-spindle machine.

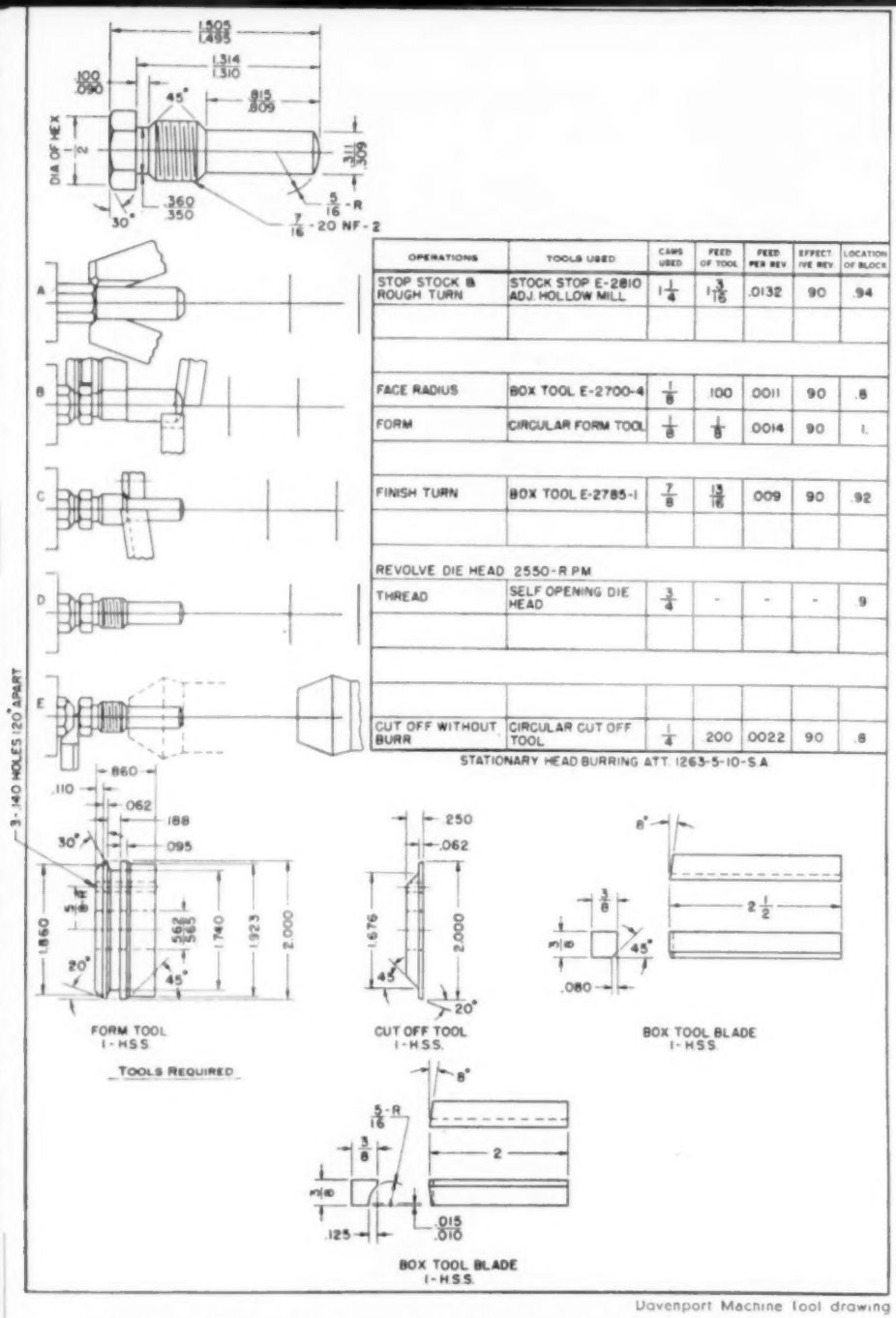
is drilled part-way with a ¼″ drill while being formed from the cross-slide. At "B" it is drilled deeper with a smaller drill and the deeper forming cut taken. Position "C" provides for drilling the rest of the way through the piece, and for sizing, while at "D" the bushing is tapped. At "E", the burring attachment chuck has advanced to the left and is holding the bushing while it is being severed by the cut-off tool. At the right at "E", it is shown in its retreated position, but still revolving, while in engagement with the countersinking tool. A countersinking arm attachment is used to make this operation possible.

These machines are used chiefly in production of relatively small diameter work of high quality. Standard feed tubes handle stock 9/16″ round, ½″ hexagon and ⅜″ square. However, oversized spindles can be fitted to give the machine capacity for rounds to ¾″, and the other shapes in proportion. Fifty standard cams, for quick mounting, are furnished with the machine. Tool travel may be adjusted to correspond exactly to the rise of the cams being used, or it may be less or more.

Thus, a far wider range of possibilities is offered with a fewer number of cams than could otherwise be possible. The turret cams are mounted on one sleeve, the cross-slide cams on another. They can be changed in three minutes or less.

FIGURE 2. Cross-drilling attachment is mounted in combination with a fifth cross-slide. View is from front.





OPERATIONS	TOOLS USED	CAMS USED	FEED OF TOOL	FEED PER REV.	EFFECTIVE REV.	LOCATION OF BLOCK
STOP STOCK & ROUGH TURN	STOCK STOP E-2810 ADJ. HOLLOW MILL	1 1/4	1 3/16	.0132	90	.94
FACE RADIUS	BOX TOOL E-2700-4	1/8	100	0011	90	.8
FORM	CIRCULAR FORM TOOL	1/8	1/8	0014	90	1.
FINISH TURN	BOX TOOL E-2785-1	7/8	13/16	009	90	.92
REVOLVE DIE HEAD 2550-R P.M.						
THREAD	SELF OPENING DIE HEAD	3/4	-	-	-	9
CUT OFF WITHOUT BURR	CIRCULAR CUT OFF TOOL	1/4	200	0022	90	.8

STATIONARY HEAD BURRING ATT. 1263-5-10-S.A

Davenport Machine Tool drawing

FIGURE 3. Operation cycle performed by five-spindle machine on a special adjusting screw. Use of a burring attachment is illustrated here.

Tapping Tools and Other Attachments

In addition to the attachments mentioned for burring and various "back-end" operations on this five-spindle machine, the cross-drilling attachment, and the die-head, a full line of the standard screw machine tools is available. Examples are milling attachments and screw slotting attachments. It is an especially fine machine for the production of small screws, whether they are of the slotted type, or ordinary machine screws from "hex" stock. Of the latter, as many as 40 per minute have been produced complete, and without a burr.

Small nuts, too, have been produced at exceedingly high speeds. In one job employing bent taps, small dry battery nuts of brass were produced at the rate of 180 per minute.

These nuts are worked off the rods in pairs. That is, in the first position, knurling was performed at two points. The rod was projected far enough before being stopped at the first position to allow sufficient length for two of the nuts. The end of the rod was also centered at the first position. In the second position, the first nut was drilled and counterbored with a combination tool and both nuts were formed from the cross-slide. At the third position, the farthest extended nut was gripped in an auxiliary tapping chuck, and cut off, then forced over the bent tap for tapping. In the fourth position, the second nut was drilled and counterbored, and at the fifth position, it was gripped in a second tapping chuck, cut off, and then forced while revolving over a second bent tap. Thus, two nuts were completed in each cycle.

Bent taps for work of this kind are available from tap manufacturers, just as are straight taps, and tool holders adaptable to taps, drills, reamers and other end working units. Compensating tool holders for correcting misalignment between the turret mounting or other tool mounting and the spindle also are available.

In some cases solid dies are used, and in other cases so-called spring dies which are especially well adapted for screw machine work, are furnished by toolmakers. Die-holders are, of course, necessary for some of these dies. Acorn type holders are made for all types of screw machines by some tool firms, and these have a compensating adjustment that can be used for correcting misalignment.

Cut-off tools sometimes present a problem, especially when the cut is straight and the diameter to be cut off is large. Because of the heat generated in cutting, some expansion of the chip is to be expected, and there may be some expansion that is regarded as purely mechanical.

One type of cut-off blade, however, has been designed to permit normal expansion of the bursting chips. Such cut-off blades and cut-off tool holders to go with them have been made available for all makes of automatic screw machines. In addition to being sold by the manufacturer, they are jobbed by suppliers. They provide smoother finishes, produce more cuts per hour, and make more cuts between re-grinds.

Lubrication

Lubrication, the life blood of any machine, is particularly vital in the automatic screw machine. One outstanding screw machine builder provides a splash system of lubrication for the gear box. Oil going into lubrication lines passes through a filtering device. A section through such a unit is shown in Figure 5, together with instructions for keeping it functioning.

Regardless of whether the manufacturer of an automatic screw machine elects to design and build his own lubricating system, or to use a system developed by lubrication specialists, the object is to supply exactly the right amount of oil to each port.

Cutting Fluid Application

Although space does not allow consideration of cutting fluids for specific circumstances, proper selection of a coolant is a vital factor. Also, it is important that application of the fluid to the tools and to the work be ample and efficient. Present day tough alloy steels, heavy loads on the machines, and continuous running for 24 hours a day make this imperative.

Some inexperienced operators apply cutting oil on the work only, largely deflecting it from the tool. Correctly applied, the flow of coolant reaches the tool and the work equally. When machining at high speed, the operator should so direct the coolant that it will not be carried away from the tool by fast moving chips. Sometimes best results are obtained if coolant can be piped from beneath the tool; in other cases, directing a flow of lubricant from each side of the tool is most satisfactory.

In threading work, it is important to run the coolant through the diehead in such manner as to wash the chips out of the head. Tools provided with roller rests should be placed with the pipe nozzle close enough to lubricate the rollers as well as the work and the cutting tool.

In drilling operations, it is important that the lubricant be fed to the point of cutting. Where deep-hole work is involved, coolant is sometimes piped directly through the tool. Some automatic screw machines have built-in coolant systems which distribute the coolant through the tool and cross-slides directly to the cutting tools.

An interesting development in the application of coolant to screw machine operation, especially where relatively large numbers of machines are used, is employment of a centrifuge for re-conditioning cutting oil. Centrifugal oil extractors, used for extracting oil from chips, may be obtained from various suppliers.

One large builder of modern automatic screw machines makes a centrifuge particularly adapted for this work. An interesting coolant reconditioning layout using this centrifuge and serving two four-spindle type screw machines is shown in Figure 6. However, a battery of machines may be readily accommodated.

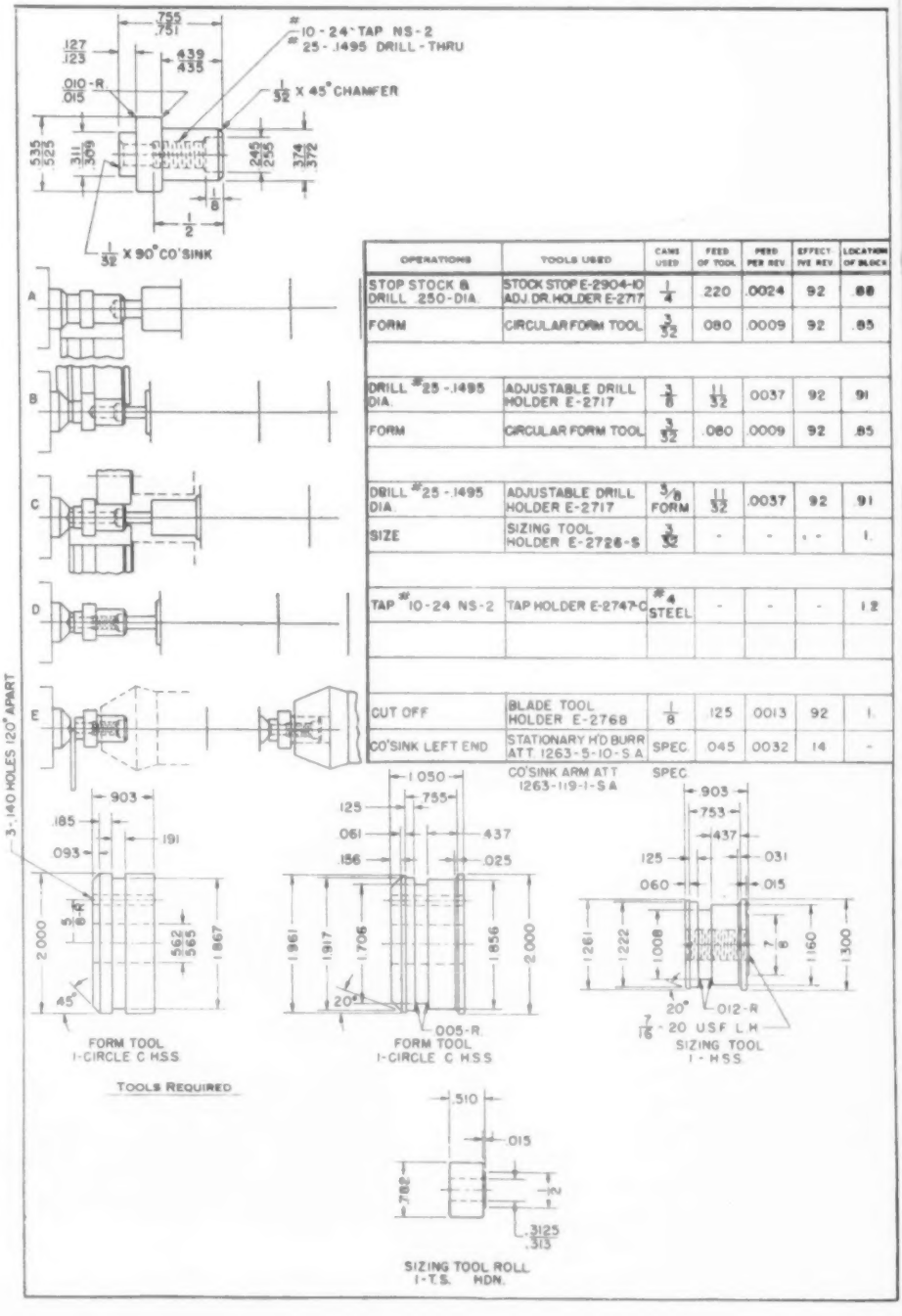
All factors affecting chips and coolant have been carefully considered. Cams and gears are fully enclosed, and chip pans at the bases of most models are designed to drain the oil from the chips. Oil guards do not have to be lifted off but can be rolled to one side, and as readily rolled back into place after necessary adjustments are made. Further, a standard chip conveyor is available. Such conveyors save machine and operator time, for they carry the chips up an incline over the edge of the chip pan and into a receptacle. Oil is drained from the chips during the process.

Different Drives From Motor

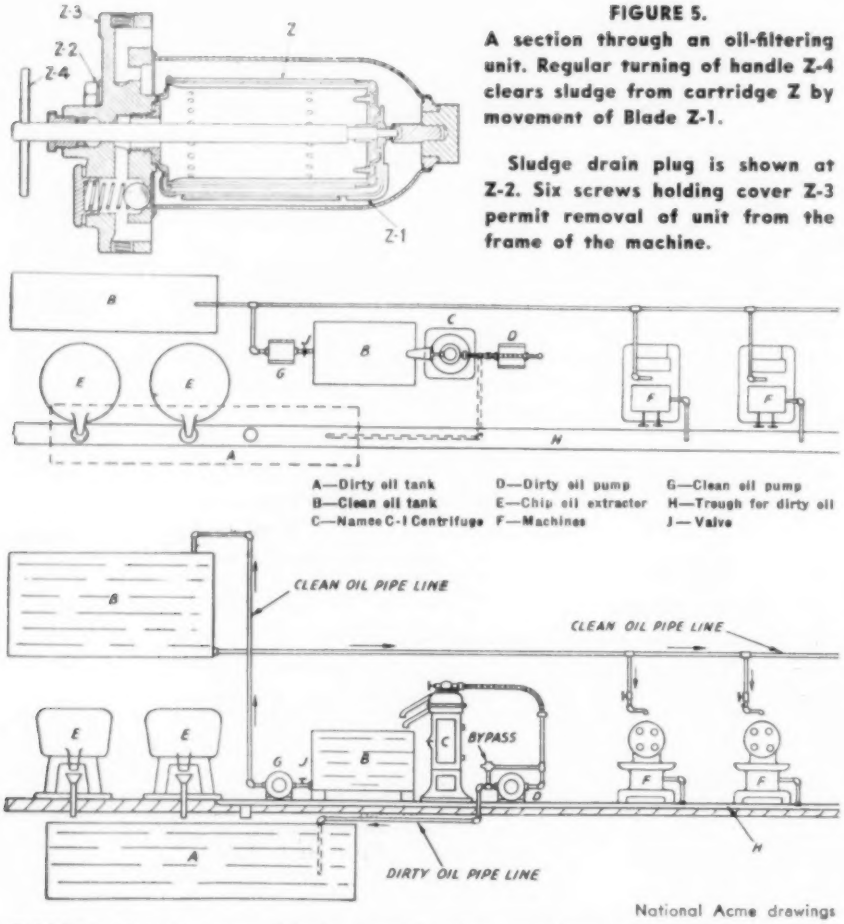
In the modern screw machines made by one firm, the motor is positioned on a plate, atop the gear box, and the main drive from the motor may be either by chain or by multiple V-belts. These machines are widely used in munitions work. In addition to a full range of ordinary screw machine sizes, specials have

FIGURE 4. Operation cycle which provides 1/32" by 90° countersink in the internally-threaded bushing detailed in upper left-hand corner of drawing.

Davenport Machine Tool drawing



OPERATIONS	TOOLS USED	CAMS USED	FEED OF TOOL	FEED PER REV	EFFECTIVE REV	LOCATION OF BLOCK
STOP STOCK & DRILL .250-DIA.	STOCK STOP E-2904-10 ADJ DR. HOLDER E-2717	1/4	220	.0024	92	.88
FORM	CIRCULAR FORM TOOL	3/32	080	.0009	92	.85
DRILL #25-.1495 DIA.	ADJUSTABLE DRILL HOLDER E-2717	3/8	11/32	.0037	92	.91
FORM	CIRCULAR FORM TOOL	3/32	.080	.0009	92	.85
DRILL #25-.1495 DIA.	ADJUSTABLE DRILL HOLDER E-2717	3/8 FORM	11/32	.0037	92	.91
SIZE	SIZING TOOL HOLDER E-2726-S	3/32	-	-	-	1.
TAP #10-24 NS-2	TAP HOLDER E-2747-C	#4 STEEL	-	-	-	1.2
CUT OFF	BLADE TOOL HOLDER E-2768	1/8	125	.0013	92	1.
CO'SINK LEFT END	STATIONARY H'D BURR ATT 1263-5-10-S A	SPEC.	045	.0032	14	-



National Acme drawings

FIGURE 5.
A section through an oil-filtering unit. Regular turning of handle Z-4 clears sludge from cartridge Z by movement of Blade Z-1.

Sludge drain plug is shown at Z-2. Six screws holding cover Z-3 permit removal of unit from the frame of the machine.

FIGURE 6. Coolant reconditioning layout, using centrifuge, and serving two four-spindle screw machines.

● The automatic screw machine is being installed in a growing number of mass-manufacturing plants, alongside the broaching machine, multiple drilling machine, and other high production equipment.

Because of this, today's production engineer needs facts on screw machine designs, tools and attachments, along with information on efficient methods of operating and tooling all types of metal-working equipment.

As part of THE TOOL ENGINEER'S balanced editorial service to the production man, this series of articles on Screw Machine Progress is designed to satisfy his needs so that he can deal intelligently with the problems which arise in his plant or department.

been built to produce large-diameter parts for airplane motors and tanks.

One order called for a screw machine over 14 feet long, and nearly 6 feet wide, carrying four spindles of 8" diametral capacity. Many of the units feature a disappearing stock stop, arranged to drop out of the way instantly, piston-fashion, and yet be ready, automatically, for the next piece to be fed forward.

Independent control is featured for each of the six cross-slides built into six-spindle and eight-spindle automatic screw machines built by this firm. An ingenious arrangement transmits power through two upright shafts from the lower cross-slide cam drums to both the intermediate and the top cross-slide-actuating cam drums. The cam drums for the intermediate slides are mounted vertically, whereas those for the top slides are horizontal, with their axes at 90° to the lower cross-slide drums. This makes a highly efficient and positive linkage with the high degree of rigidity necessary for long tool life.

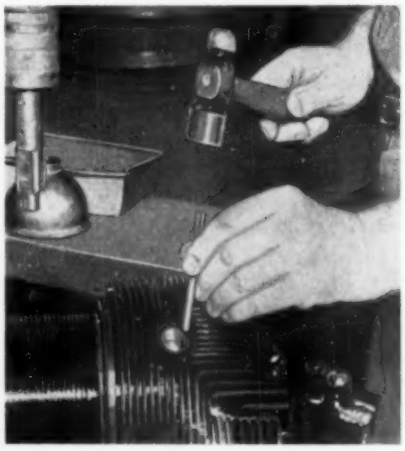
On one job, 23,700 pieces of SAE 1030 steel were rough formed and finished on one of these machines of 3-5/16" diameter capacity, using one set of circular forming tools which were still serviceable after the run.

SIMPLE PEENING PUNCH REDUCES SCRAP

A SIMPLE DEVICE for staking keeper pins, used on spark plug bushings in the cylinder heads of Lycoming aircraft engines, has reduced scrap from this operation by 98 per cent.

Heretofore, a prick punch was used. This method failed to distribute pressure of the hammer blow so that adjacent metal of the head occasionally was cracked.

A supervisory member of this division of The Aviation Corporation at Williamsport, Pennsylvania, devised a simple peening punch. It involves a short length of drill rod, bored at one end to receive a ⅛" steel ball. After



Aviation Corporation photo

turning down the end, the ball is inserted and the feather edge of the end is tooled down to hold the ball. The opposite end of the 4" section of the rod is narrowed, beveled, to prevent its being rolled over by hammer blows, and then fire hardened.

This easily made and inexpensive tool, when used for staking the keeper pins, results in their being peened rather than wedged out at a given point, inasmuch as the hammer blow is distributed by the spherical surface on the steel ball in the end. This operation also affords the advantage of virtually eliminating the hazard of cracking parts.

Walworth photo

Big, all purpose machine tools are used for large castings and small runs not suited to high production equipment.

JOHN E. GILCHRIST

EQUIPMENT ENGINEER
WALWORTH COMPANY
WASHINGTON PARK WORKS

SHIP assembling records, set day after day upon the shores of America's oceans, lakes, and rivers, depend on day after day production, without fanfare, of hundreds of parts and fittings. Much of this manufacturing is done far from either coast.

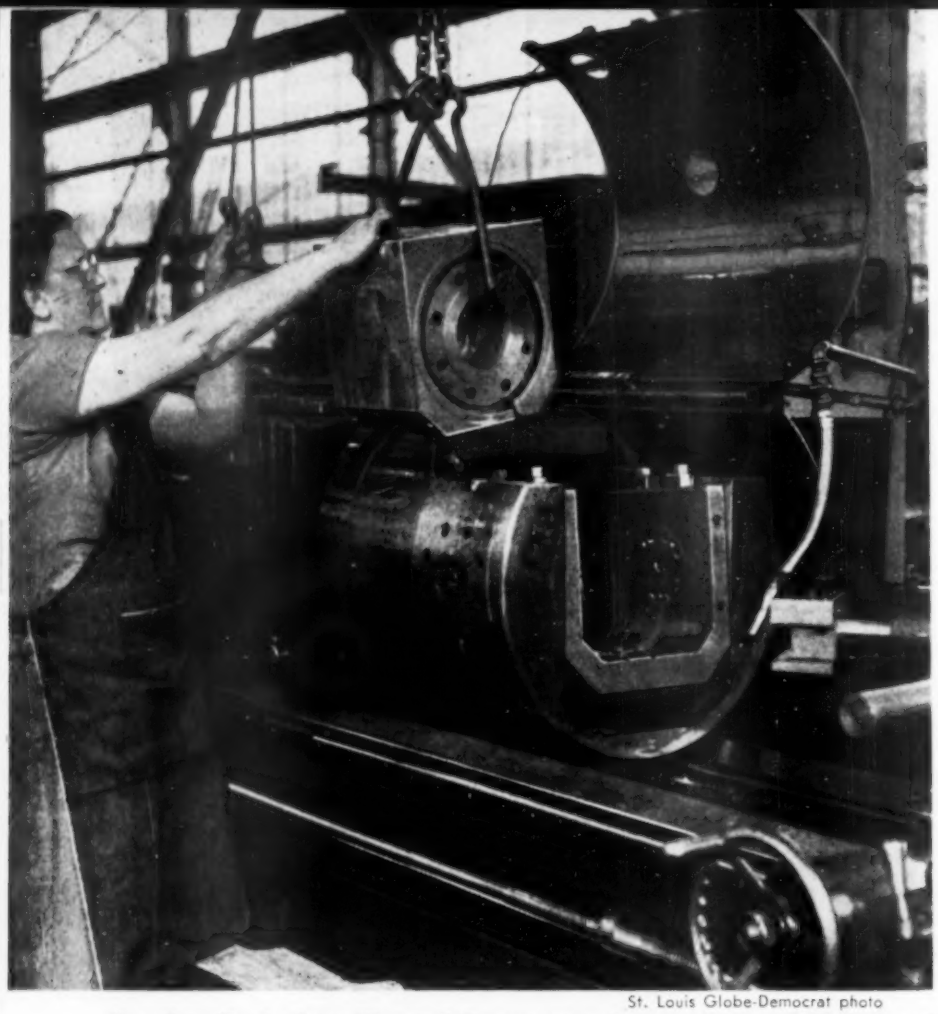
Valves to control the flow of water, steam, oil, and air are as essential as any of the supplementary parts of a ship. To meet the demand for large quantities of valves, it has been necessary for the industry as a whole to expand production facilities. This expansion is exemplified by the new Washington Park Works of The Walworth Company (near East St. Louis, Illinois). Although the site was a corn field eighteen months ago this plant recently produced in one month approximately 500 tons of steel valves —enough to outfit one battle ship of the new Missouri class.

Production expressed in tons, however, does not adequately represent the magnitude of the task. Scores of machining and fitting operations are involved in the preparation of steel castings for use as valve parts. Another problem satisfactorily solved by the Walworth Company was that of adapting green and unskilled labor to the operation of tools where precision and accuracy is paramount. When the new foundry was ready to begin production, and the big lathes and boring mills had satisfactorily passed initial running-in tests, East St. Louis and the surrounding towns had been literally drained of machinists and other skilled labor. Even now, unskilled labor was not easy to obtain. The problem was solved by starting with a skeleton crew from the other existing plants of the Walworth Company. This crew trained an initial operating force through the facilities of class room instruction and actual practice on the tools which they were to operate. Many members of that initial crew subsequently became foremen or supervisors and under the joint leadership of this group and the training engineer, the present operating force of 1000 production employees has been established.

The product of this plant comprises a full line of steel valves ranging in size from 2″ to 30″ together with some special types made to particular Navy specifications. Steel castings for the principal valve parts are produced in a foundry covering about 35,000 square feet. The moulding floor is served by modern equipment of the jolt-squeeze, jolt-rollover, and sand slinger types.

An acid electric melting furnace produces steel of two grades—plain carbon steel which is used for steam ratings of 300 pounds pressure and

Novel 5-position cradle chuck for precision turret lathe work is one of several devices which make possible a balance between line production and jobbing work required to produce 500 tons of valves for one battleship



St. Louis Globe-Democrat photo

Use of cradle chucks on Warner & Swasey turret lathes permits rapid indexing of rough casting to five different positions with only one centering operation.

750°F and carbon molybdenum steel for pressures higher than 300 pounds and operating temperatures up to 900°F.

Brass and stainless bar stock and forgings are obtained from outside suppliers.

Finishing and assembly operations are accomplished in two adjoining buildings aggregating 80,000 square feet. Incorporated in these buildings are tool room, heat treating, maintenance, and shipping facilities.

The machine tool layout is such as to permit a flow sequence approximating line production in one of the two buildings. Here on longer runs, valve sizes up to 6″ are produced. Larger sizes and smaller production runs are handled in a manner simulating a job work basis in the remaining portion of the shop.

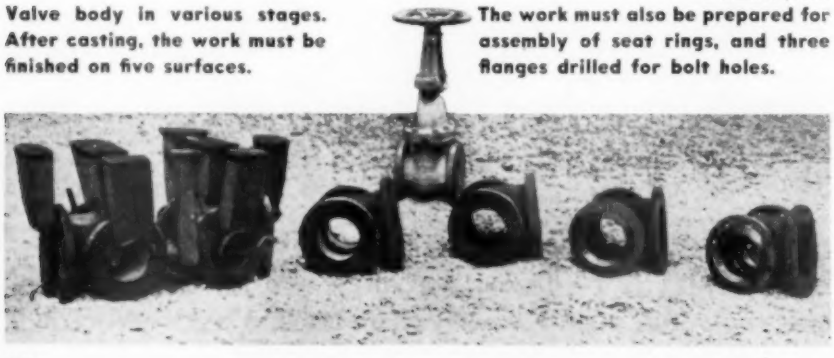
Valve bodies and bonnets are produced from rough castings by machining the several flange faces and such other portions as are required for the incorporation of seat rings, packing glands, discs, etc. The amount of metal removed in the machining operations varies between the approximate limits of five and 10 per cent. In the conversion of rough castings into finished parts, about 60 to 80 tons of metal per month must be removed by the various machine tools. Most of this work must be done with precision represented by tolerances of only a few thousandths of an inch. Established standards for over-all dimensions must be observed and the mating parts constituting a joint between matched pressure-containing castings must make up as pressure-tight joints. Seating surfaces which in some designs have sliding contact may be ground for the final fitting operation.

A general cross-section picture of the manufacturing procedure followed in this plant may be obtained from a study of the operations necessary to produce the several principal parts of a wedge gate valve. Five principal parts constitute the assembly. These are the body, bonnet, disc, seat-rings, and stem (See drawing).

Walworth photo

Valve body in various stages. After casting, the work must be finished on five surfaces.

The work must also be prepared for assembly of seat rings, and three flanges drilled for bolt holes.



Cradle chuck on turret lathe

The body must be finished on five surfaces, prepared for the assembly of seat rings, and three flanges drilled for bolt holes. The five operations on the body of sizes up to six inches consist of: (1 and 2) facing the two run flanges, (3) facing the bonnet flange on body, (4 and 5) boring and threading the two recesses for seat rings. In the 2″ and 3″ sizes these five operations are performed by a battery of 3A Warner and Swasey turret lathes. The same operations on the 4″, 5″, and 6″ sizes are accomplished on a similar battery of 4A Warner and Swasey lathes. These same machines are also tooled for swing check, angle and globe valve bodies and parts. The machine tool layout represents an excellent application of tool engineering, since the various machines operate at capacity, yet the production of the various component parts of a valve is so balanced as to assure a steady flow to the assembly department without excessive parts storage along the line.

The most spectacular fixtures in the shop are the cradle chucks on the Warner and Swasey turret lathes. The rough body castings are centered in cradle boxes. By providing two boxes for each size valve body the operator may perform the centering operation in one box on a work table while the other box is in active service on the lathe. Thus no machine time is lost for chucking operations. The cradle chucks are fitted with indexing pins

which permit the body to be rapidly indexed to any of the five positions required for the finishing operations.

Thus when a new box containing a rough casting has been located in the chuck, one run flange face is immediately finished. By rotating the cradle 180° the opposite run flange is faced. Another 90° rotation indexes to the correct position for facing the bonnet flange. Similarly indexing to planes 5° plus and minus from the plane of the end flanges aligns the body for the counterboring and threading of the seat ring recesses.

Since all five finishing operations are performed without disturbing the alignment of the casting in the cradle chuck, proper alignment of the several machined surfaces is definitely assured. Furthermore, since no centering or alignment set-ups are required while the part is on the machine, maximum production is obtained.

When the casting is removed from the cradle chuck, bolt holes are drilled in the run flanges and bonnet flange using multiple spindle drills and standard drill jigs. Following those operations the bolt holes are spot faced, the casting is washed, the holes are deburred, and the seat rings are driven in using a pneumatic tool.

The disc or wedge which must fit accurately into the body seat rings is handled in the following manner:

1. Center the top and bottom of the disc.
2. Locate on centers and mill the guide slots.
3. Locate by guide slots in an index chuck having locator inserts set off 5° to the face of the machine spindle.
4. Machine one seat face of disc.
5. Index chuck 180° and machine the other face of disc.

The disc faces are finally ground on special fixtures in rotary grinding machines. After a final check on the body and wedge combination, these parts are transferred as a unit to the assembly floor.

Machining large castings

On the smaller sizes of valves the yoke which supports the operating nut is incorporated as a part of the bonnet casting whereas on the larger sizes the yoke is a separate casting, faced and bolted to the bonnet. With this exception the machining operations are similar. The bonnet casting is mounted in a bird cage fixture wherein the body flange is faced and the bonnet bushing recess is bored and threaded. The faced flange is then mounted on a head plate whereon the top end is faced and the stuffing box is bored and reamed.

The foregoing description applies particularly to those sizes of valves which are susceptible of handling in special devices such as cradle chucks.

Larger castings such as the bodies, bonnets, and discs, which are too heavy or bulky or for runs too short for that type of equipment, are machined on vertical turret lathes or boring mills. The largest unit in this group is a 96 inch Cincinnati Hypro Boring Mill. Bolt holes for the larger castings wherein the bolt circles are beyond the capacity of the multiple spindle drill presses are drilled on radials. These drills are also used to drill and tap other parts not well adapted to the high production equipment or in cases of small quantities.

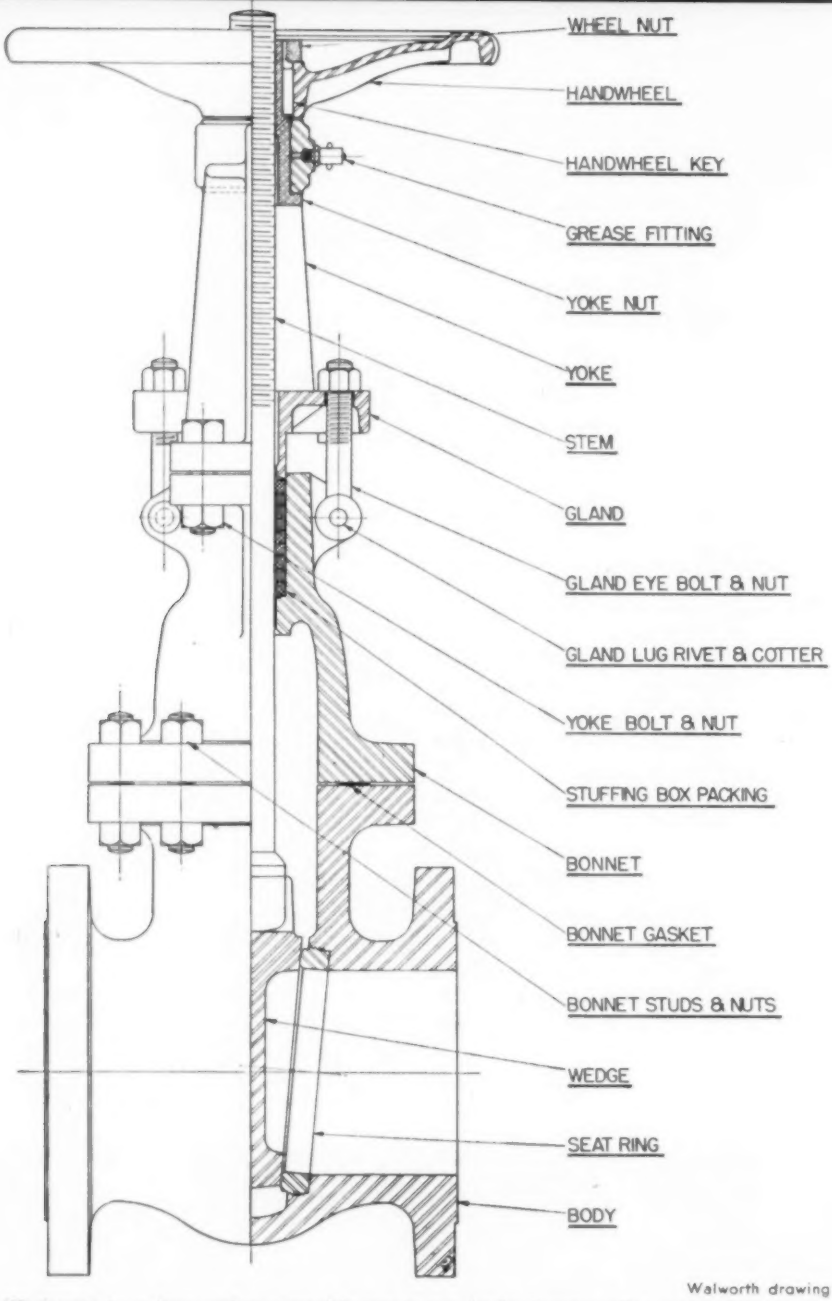
Seat rings are produced from castings, forgings, or coiled and welded bar stock and may be of bronze, stainless steel, monel metal or hard faced material according to specifications. They are generally turned, faced, and threaded on turret lathes. The seating surfaces of hard faced rings are ground, or turned on Heald Borematics. For the application of driving wrenches, slots may be broached in the rings or lugs applied by arc-deposited metal upon the inside surface.

Stems of brass or stainless steel are turned to the proper diameter in turret lathes. The square or Acme operating thread is cut on a Landmaco

St. Louis Globe-Democrat photo

When the casting is removed from the cradle chuck—shown on the opposite page—bolt holes are drilled in the run flanges, using multiple spindle drills and standard drill jigs. Following these operations, the bolt holes are spot faced, the casting is washed, and holes are deburred.

When bolt holes are within circles beyond the capacity of multiple spindle drill presses, radial drill presses are used. Such equipment also is used to drill and tap other parts not suited to the high production equipment shown here.



Walworth drawing

Wedge-gate valve: major assembly parts are body, bonnet, disc, seat rings, stem.

Ready to ship, valves are identified with pressure rating, trim description.

St. Louis Globe-Democrat photo

threading machine or milled on a thread milling machine. Stainless steel stems are ground to produce a smooth finish.

Yoke nuts, usually of bronze castings, are faced, bored, tapped for the Acme operating thread, turned and threaded on the outside for the handwheel nut on turret lathes.

Bonnet bushings are produced from bar stock on turret lathes. Depending upon the design they may be threaded for tightening into the bonnet or prepared for a press fit followed by seal-welding.

The hubs of hand wheel castings are faced on both sides and reamed on a drill press.

Gland castings are reamed and turned on turret lathes.

Carbide cutting tools are used wherever the operation permits their practicable application, thus effecting high production rates. For example, in the turning, boring, and facing operations on stainless steel seat rings, a cutting speed of from 200 to 220 feet per minute is accomplished with a feed of 0.0083″ and 1/16″ depth of cut.

Assembly and inspection

Parts are moved from one machine or department to another in tote boxes accompanied by the proper operation and scheduling sheets. Expediters maintain the flow of materials for the various parts through the several departments to finished parts stores and finally to assembly and testing.

Each valve is tested under the appropriate hydro-static pressure for its particular rating to assure soundness of metal and adequacy of bolted pressure joints etc.

Hydro-static test pressures up to 10,000 psi. are available in the assembly and test departments.

Pressure tightness at the seating surfaces is checked not only hydrostatically but also by compressed air with water submergence.

From the test stands valves move over a conveyor to the shipping department. Enroute they are stamped by a Navy Inspector when so required, tagged with an identification plate containing serial number, pressure rating, and trim description. Flange protectors are applied and the valve is spray painted.

The plant, in general, exemplifies a modern, well engineered foundry and machine shop. THE END

Keep producing for victory —but plan for peace

WARNER & SWASEY field men have kept contact with hundreds of manufacturers throughout this war period. As production engineers they are offering their experience to help shops that converted to war and the hundreds of new plants that were built exclusively for war purposes.

In one large aircraft plant, they recommended changes in machining sequences that produced a volume on ten turret lathes equal to that of twenty turret lathes working under former method.

In a sub-contractor's plant they advised a different model machine than the ones being used for the same operation by the prime contractor; it resulted in greater production—and lower cost per piece.

In another war plant (one of the world's largest) a group of Warner & Swasey engineers worked for weeks, planning machines and layout for the entire metal turning department.

Many manufacturers, looking ahead, know transition from war to peacetime production must be accomplished quickly if they are to maintain employment. They realize that postwar competition will be keen—that only the most modern machines, techniques, and methods will keep them in front in the struggle for domestic and foreign markets.

Planning for postwar can be done now *without* impairing all-out production necessary to win the war. The war's end will bring new challenges—and American industry must be prepared to accept them.

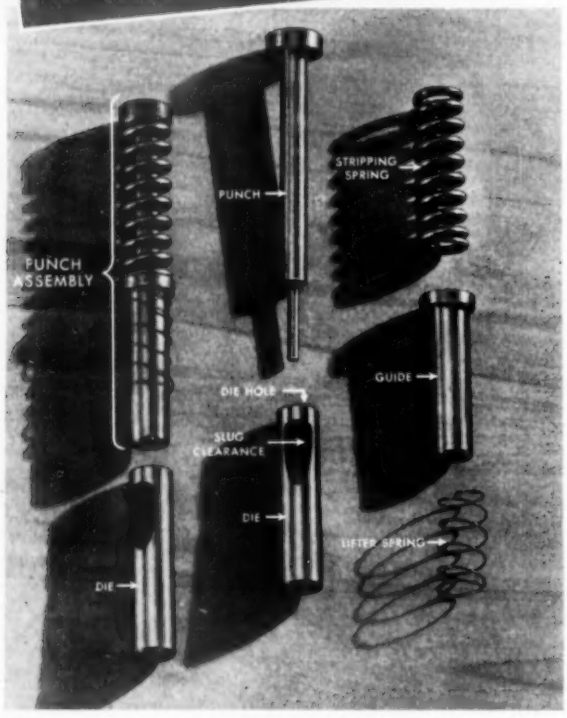
IT IS PATRIOTIC TO PLAN NOW FOR THE POSTWAR ERA

Warner & Swasey offers you practical help on postwar planning. We have a corps of engineers who are skilled in *all* machine operations involved in production of precision parts made of metal. They are helping many war plants improve methods and machines for greater production. They will continue to do so, but their services are also available to management interested in planning now for the future. Write Warner & Swasey, Cleveland 3, Ohio.

WARNER & SWASEY
Turret Lathes
Cleveland

YOU CAN TURN IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

WALES *Plate Set System*



Wales PS Punch Assemblies and Dies showing parts assembled and disassembled.

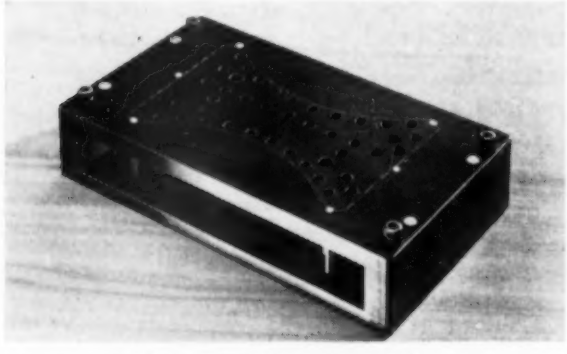
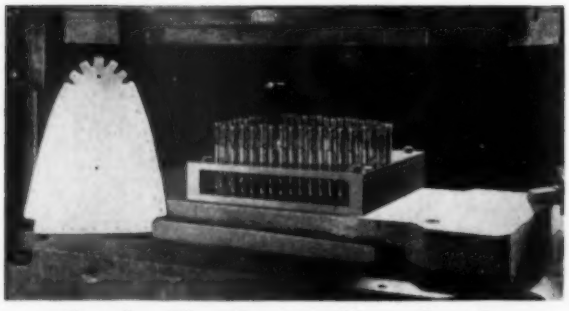


Plate Set with pattern holes.



Complete Plate Set Assembly ready to be placed on press bed.

DESIGNED FOR PUNCHING HOLES IN SHEET METAL IN AIRCRAFT FABRICATION

This System is made up of:

1. Walesite Plate Sets.
2. Wales PS Punching Assemblies and Dies.

The complete, self-contained Plate Set Assembly may be made quickly and easily outside the press.

Placed on the press bed, punching may start on first stroke of the ram . . . no adjusting . . . no locating . . . and nothing is attached to press ram.

This System is simple, fast, convenient, economical, easy to operate, no scratching and positive locating of parts.

Wales PS Punch Assemblies and Dies punch holes up to 5/16″ diameters. By standardizing on outside diameters of Punch Assemblies and Dies they are interchangeable between plate sets which permits their continuous use and re-use in unlimited patterns. Walesite Plate Sets are built in 36 standard sizes up to 42″ x 45″ working areas.

2 CHOICES

1. Template may be sent to us for quotation of complete die ready to operate. We recommend this procedure.

2. To the user who desires to build the dies, we will supply Plate Sets, Punch Assemblies and Dies with complete drilling and assembling instructions.

Write for Catalog PS.

WALES-STRIPPIT CORPORATION

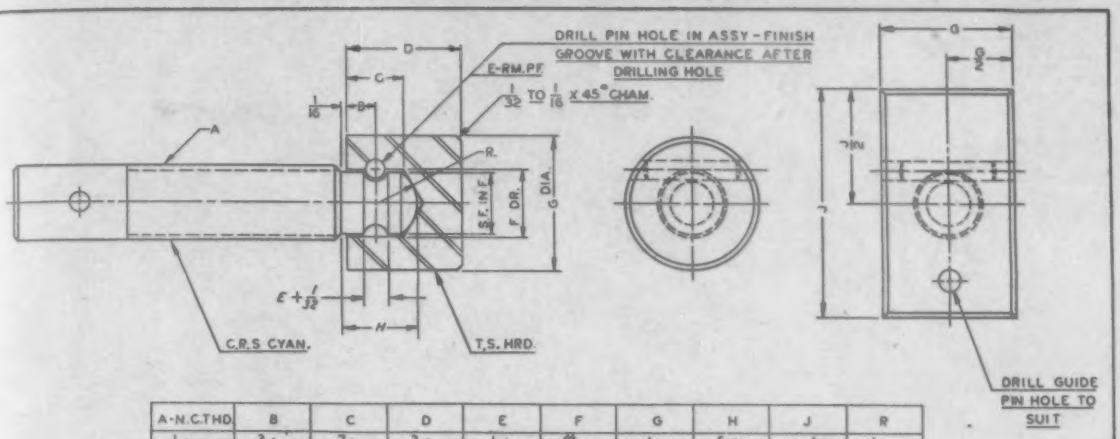
353 Payne Avenue No. Tonawanda, N. Y.

GEORGE F. WALES, President

Specialists in Punching and Notching Equipment

PRODUCTION DATA SHEET

SWIVEL CLAMP PROPORTIONS



A-N.C.THD.	B	C	D	E	F	G	H	J	R
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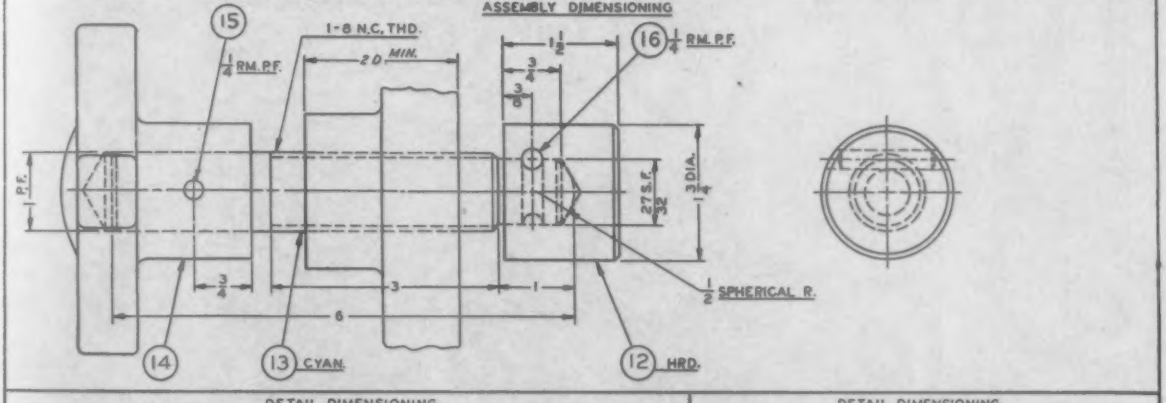
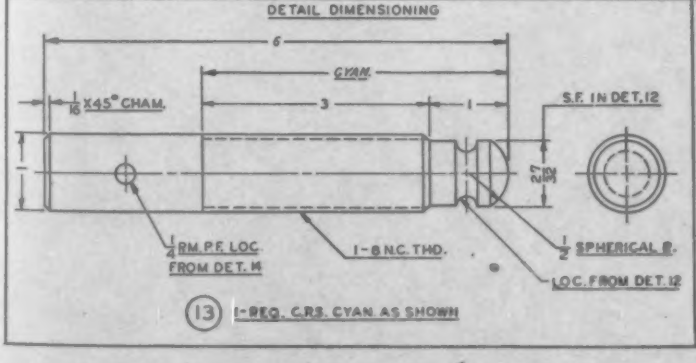
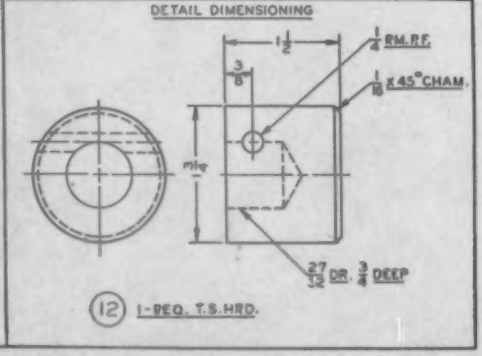
5/16-18	1/8	1/4	1/2	3/32	"C"	5/8	3/8	1 1/2	5/32
5/16-18	1/8	1/4	1/2	3/32	"C"	3/4	3/8	1 1/2	5/32
3/8-16	5/32	5/16	5/8	1/8	"M"	3/4	7/16	1 3/4	3/16
1/2-13	1/32	7/16	3/4	3/16	13/32	1	19/32	1 3/4	1/4
1/2-13	7/32	7/16	7/8	3/16	13/32	1 1/4	19/32	2	1/4
1/2-13	7/32	7/16	7/8	3/16	13/32	1 3/4	19/32	2 1/4	1/4
5/8-11	1/4	1/2	1	3/16	1/2	1 1/4	11/16	2 1/4	5/16
3/4-10	9/32	9/16	1 1/4	3/16	5/8	1 1/2	3/4	2 3/4	3/8
1-8	3/8	3/4	1 1/2	1/4	27/32	1 3/4	1	3	1/2
1 1/8-7	3/8	13/16	1 1/2	1/4	15/16	2	1 1/16	3	5/8
1 1/4-7	7/16	15/16	1 3/4	5/16	1 1/16	2 1/4	1 3/16	3 1/2	3/4
1 1/2-6	1/2	1 1/8	2	3/8	1 1/4	2 1/2	1 7/16	4	7/8







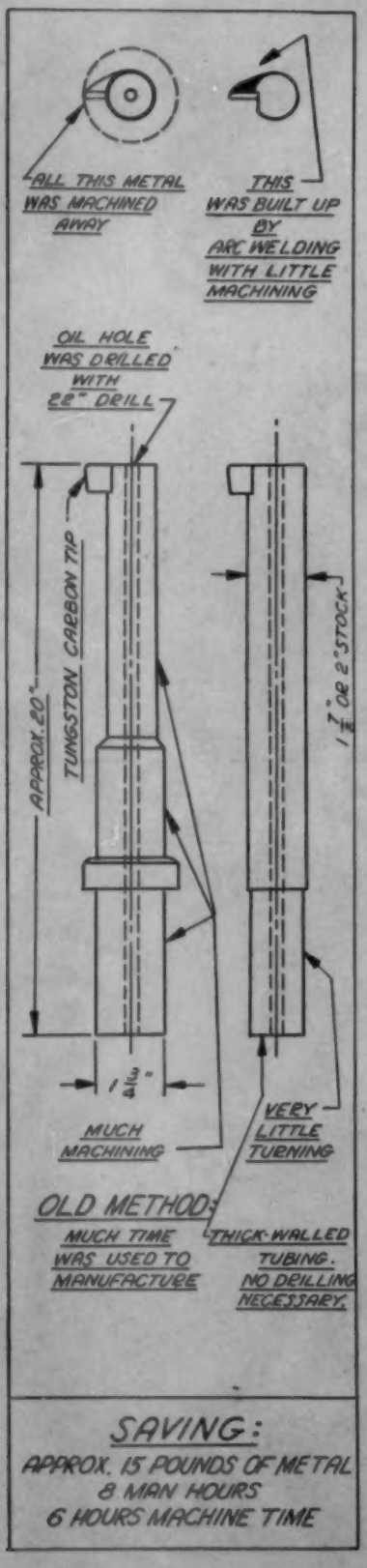
Courtesy of Acme School of Die Design Engineering

NOTE: On this page is the twenty-fifth of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

THE CRIB

T. M. REG. U. S. PAT. OFF.

IDEAS · KINKS · SHORT CUTS


ALL THIS METAL WAS MACHINED AWAY
THIS WAS BUILT UP BY ARC WELDING WITH LITTLE MACHINING
OIL HOLE WAS DRILLED WITH 22" DRILL
APPROX. 20"
TUNGSTEN CARBON TIP
1 7/8" OR 2" STOCK
1 1/4"
MUCH MACHINING
VERY LITTLE TURNING
OLD METHOD:
MUCH TIME WAS USED TO MANUFACTURE
THICK-WALLED TUBING. NO DRILLING NECESSARY.
SAVING:
APPROX. 15 POUNDS OF METAL
8 MAN HOURS
6 HOURS MACHINE TIME

Slip Joint for Drill Press

OCCASIONALLY, on boring jobs a situation is encountered in which the spindle travel of the drilling machine or boring mill is long enough for the job, but too short to clear the fixture, especially index fixtures.

The slip joint illustrated at the right is a basic idea which can be modified considerably.

For example, a straight boring bar may become the internal slider without use of a taper adapter or extension. That would shorten the device.

The double bayonet lock serves the dual purpose of drive and thrust when "down", and safety retainer when "up". Slip fits compare with conventional quick-change collets.

● Have you ever made notes on some of your "know-how" items — or perhaps drawn sketches on a paper napkin—only to throw or give them away?

When you have an idea, short cut or kink, send it to THE TOOL ENGINEER. You will receive five dollars for each one of yours that is published. This is something to do while waiting for the soup to come, and it more than pays for the meal.

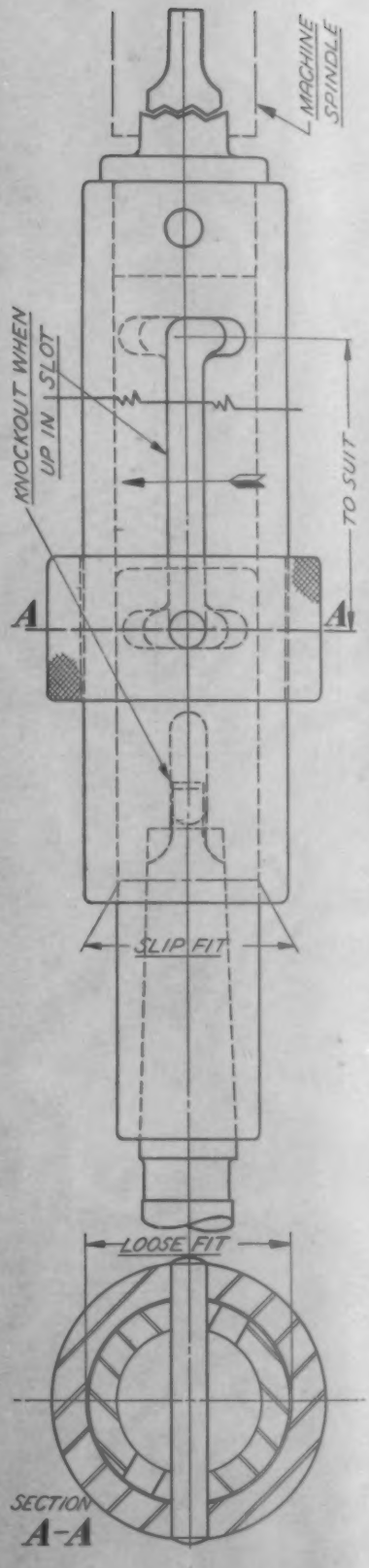
Send your time-and-material savers to The Bramson Publishing Company, 2842 W. Grand Blvd., Detroit 2, Mich.

Re-design for Welding Saves Machine Time

ENGAGED in boring landing gear struts for airplanes, Gladden Products, Incorporated, of Glendale, California, have re-designed many of their tools to save time, metal and man-hours.

Illustrated at the left are old and new methods of producing a boring bar. The new design calls for 1⅞" or 2" thick walled tubing, making drilling for an oil hole unnecessary. Cutting tip is built up by arc welding, using tool steel electrodes.

Cost of the boring bars made under the old method of machining amounted to approximately $100. Using the thick walled tubing and building up the cutting tip by arc welding, cost of the boring bars now amounts only to $20. (Drawing, courtesy Hobart Brothers.)



NEW METHOD

Boosts Template Output 6,000%

Skilled labor is not a requirement.

Stock is routed to finished dimensions on Onsrud spindle shaper. Amos Lewis, originator of the method, is shown demonstrating the operation.

Curtiss-Wright photos

Employing common shop equipment, a process devised by a Curtiss-Wright employee indicates savings of 98 per cent in time required to produce airplane templates

TEMPLATE reproduction has been a bottleneck in aircraft production, hampering the spread of work to new plants as well as production increases within existing facilities. Various non-mechanical processes have aided plane production, but a continuing problem in many plants has been that of reproducing templates accurately and economically with standard shop equipment operated by unskilled labor.

A new method has been successfully developed by the Curtiss-Wright Corporation's engineering department. By bolting the master template to stock, with spacer washers, this process permits machine shaping and displaces the tedious method of hand filing. Although the device is still in an experimental stage — with refinements and modifications being made as experience demands — the results already achieved at Curtiss-Wright's Missouri Plant indicate a time-saving of 98 per cent, or an increased output of approximately 6000 per cent.

The mechanical procedure is common to all router work and normal shop practice for other fabricating jobs. Skilled labor is not essential and the equipment is readily available in a majority of metal-working plants.

Equipment employed by Curtiss-Wright for the new process comprises:

- 1. An Onsrud spindle shaper, Type W-248 (original speed of 15,000 rpm. has been reduced to 4600 rpm.).
- 2. Standard ¼" diameter 4-fluted right-hand spiral end mill.
- 3. Wooden work table extension, 4 feet by 8 feet, to enclose the steel table top of the shaper, with a rounded cut-out to allow ample arm play for the machine operator.
- 4. An oil airline, equipped with a brass blower tube, 2½ feet in length.
- 5. Plexiglass safety shield, to protect the operator from oil spray and flying chips.

STARRETT TOOLS

The SAME AIM ...

Starrett Tools and the tools of war they're helping to make have many characteristics in common. Both are built for accurate, dependable performance under strenuous service conditions. Both are designed to supplement and sustain the skill and efficiency of their users—to help maintain the morale that hastens victory.

The makers and the distributors of Starrett Tools are acutely conscious of the importance of providing the tools essential for war production and the qualities in these tools that users rely upon to help them meet production schedules and precision standards.

You may continue to put your trust in Starrett Tools.

ARMY E NAVY

THE L. S. STARRETT CO · ATHOL · MASSACHUSETTS · U. S. A.

World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

Process depends upon a simple device.

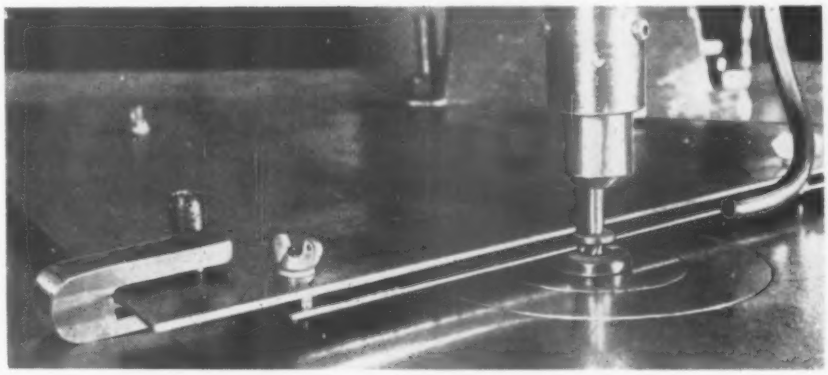
Close-up of template routing machine shows cutter and metering pin set-up.

First step in old duplicating method.

Bandsaw cuts out the printed template to within 1/32″ of final dimensions.

• 6. Ordinary spacer washers and small adjustable clamps.

The assembly, arranged so that the oil blower tube plays directly upon the cutter, is clamped to the feeding arm of the shaper, with the oil control regulator within easy reach of the machine operator.



Second step was a tedious operation.

The roughly cut-out template was filed to finished dimensions by hand.

Operation is simple. A pin of the same diameter as the cutter is supported exactly on the center line of the cutter and directly above it. The original master template is then indexed on locators in a piece of template stock which has been bandsawed to approximate dimensions. Spacers, 3/16″ thick, separate the two plates.

With the master template as a guide and the center line pin as the duplicating locator, the rough stock is forced past the cutter and contoured in exact duplication of the perimeter of the original marking template. Two or more small adjustable clamps are usually employed to minimize vibration as well as provide the operator a firm grip in pushing the assembly against the rapidly revolving cutter.

Average cutting speed has been 1″ in 4 seconds, or one linear foot of linear line cutting in 48 seconds. The success of the method can be attributed mainly to the reduction of the cutter speed in the equipment used. Speed was reduced from 15,000 rpm. to 4,600 rpm. Anything under 4,600 rpm. will reduce production which is possible at this ideal.

The finished cut requires no hand filing, except on portions of the template in which the diameter of the cutter was too large to reproduce an exact duplicate, as found in acute angles of very small radii.

Illustrating the possibilities of this method, if a type of existing airplane were needed in greatly increased numbers and different plants were selected to build it, the duplication of production templates could be made from master templates in a short time. This might reduce by several months the time required to prepare and build the planes, aircraft production engineers say. THE END

Another Production Improvement

SCORED BY WAR PRODUCTION DRIVE

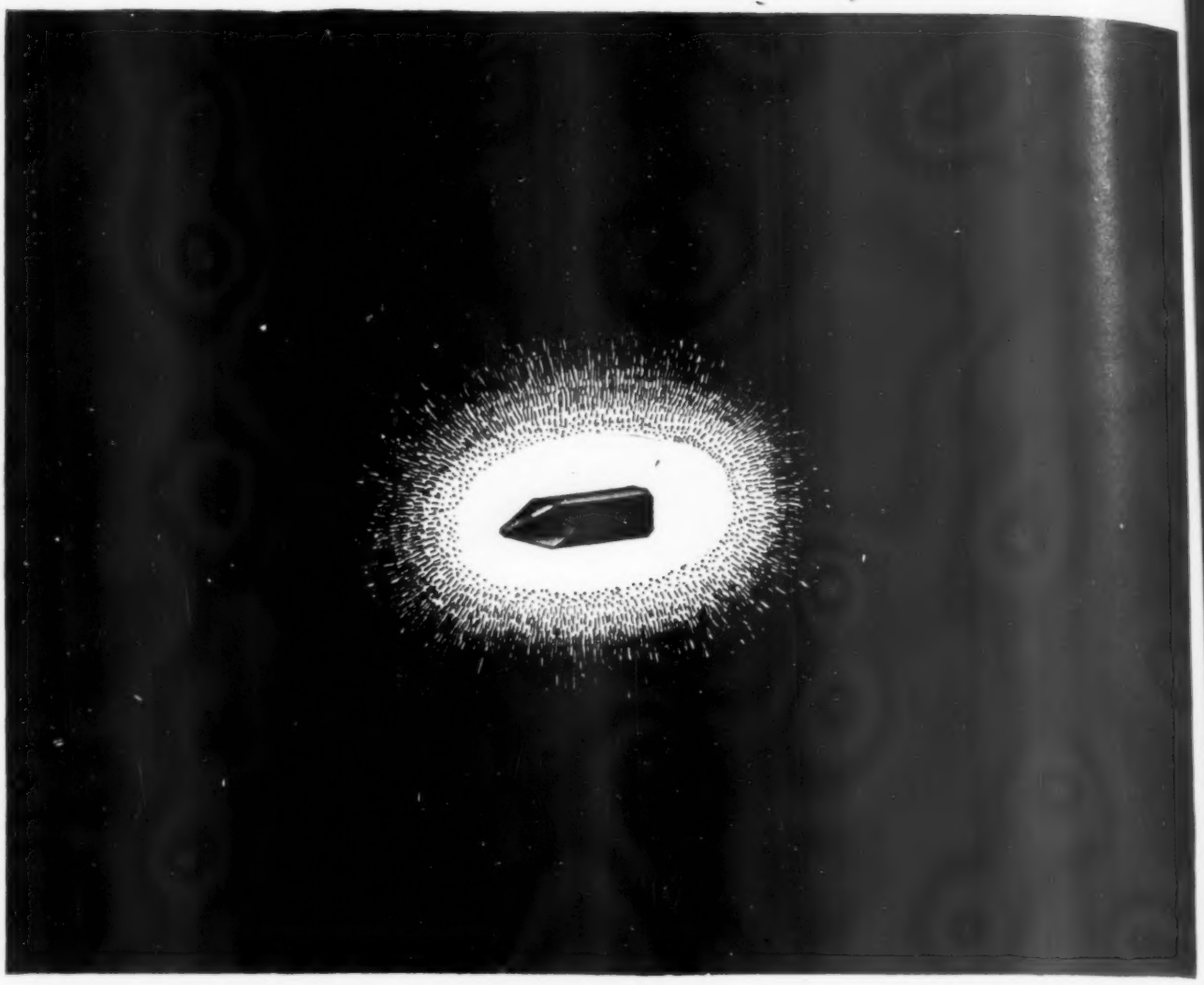
• Development of Curtiss-Wright's successful method for mechanical reproduction of templates resulted from an idea submitted through the plant's suggestion system. Amos F. Lewis, a hand filer in the template department, devised the basic method, and subsequently received the War Production Drive "Award of Individual Production Merit."

★

Prior to entering war production, Lewis' work included model making, sculpture, creation of window displays, and manufacture of metal casting and jewelry embossing dies.

★

Refinement of Lewis' time-saving suggestion is credited to Ernest W. Lenk of the Curtiss-Wright engineering department.



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Once you've bought the holders you need, you carry a stock of insert tips only. One range of inserts fits various sizes of holders. The tips are small, and hence release steel for other war uses. Float between holder and bit means less wear on the point, because tip and screw recess align easily and accurately. Lastly, return of used bits for reconditioning is unnecessary. The cost of the inserts amounts to approximately the same as reconditioning charges.

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Write for Bulletin 102, describing this new (pat. pend.) type of bit and Apex holders to fit practically every make of power drive.

APEX

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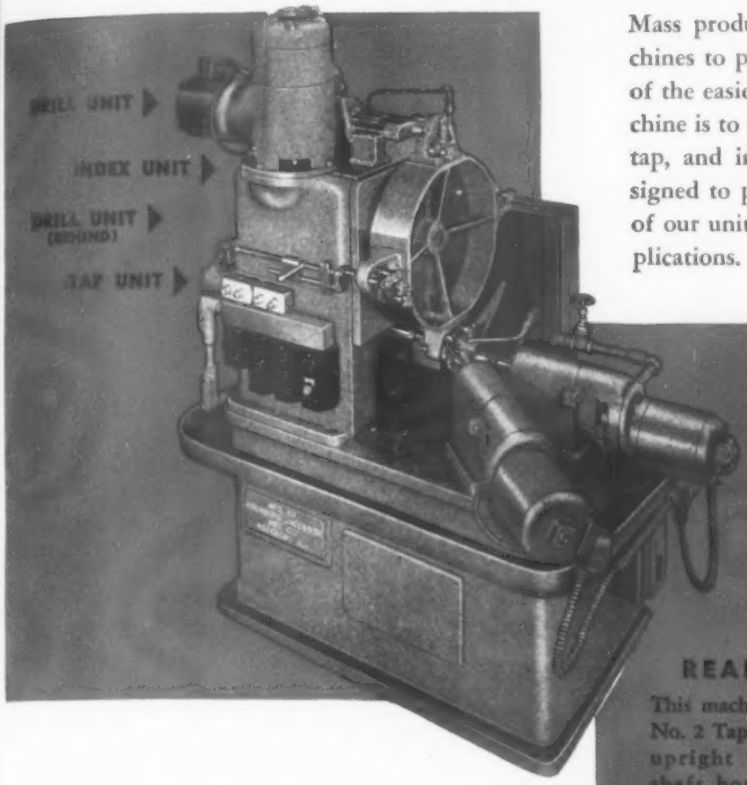
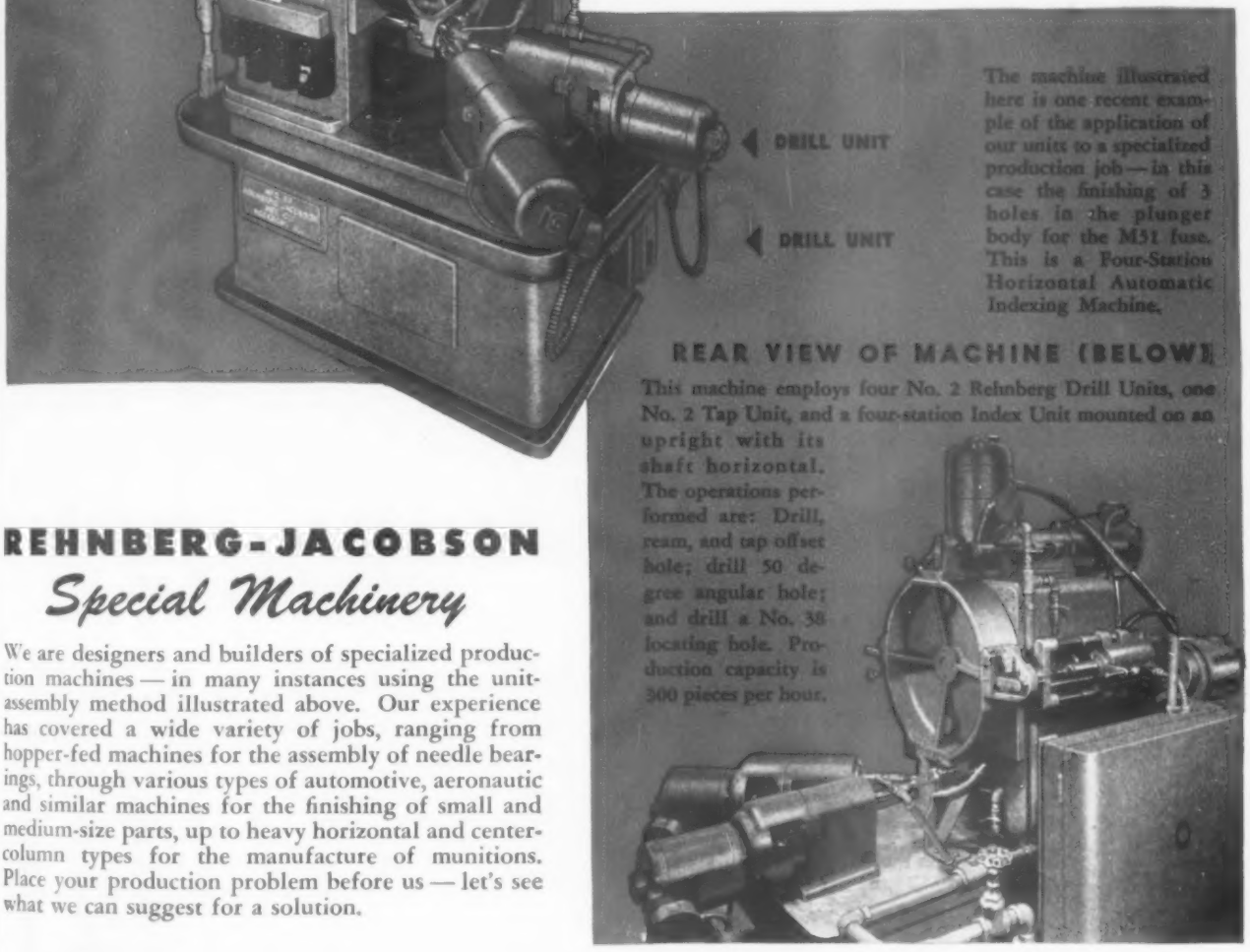
HIGHLY ADAPTABLE FOR A WIDE VARIETY OF SPECIALIZED PRODUCTION APPLICATIONS



Mass production methods constantly call for special machines to perform several operations simultaneously. One of the easiest and most practical ways to obtain such a machine is to make it up from a suitable combination of drill, tap, and index units mounted on a simple structure designed to place them in the desired positions. Thousands of our units have been successfully used on many such applications.



The machine illustrated here is one recent example of the application of our units to a specialized production job — in this case the finishing of 3 holes in the plunger body for the M51 fuse. This is a Four-Station Horizontal Automatic Indexing Machine.

REAR VIEW OF MACHINE (BELOW)

This machine employs four No. 2 Rehnberg Drill Units, one No. 2 Tap Unit, and a four-station Index Unit mounted on an upright with its shaft horizontal. The operations performed are: Drill, ream, and tap offset hole; drill 50 degree angular hole; and drill a No. 38 locating hole. Production capacity is 300 pieces per hour.

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We are designers and builders of specialized production machines — in many instances using the unit-assembly method illustrated above. Our experience has covered a wide variety of jobs, ranging from hopper-fed machines for the assembly of needle bearings, through various types of automotive, aeronautic and similar machines for the finishing of small and medium-size parts, up to heavy horizontal and center-column types for the manufacture of munitions. Place your production problem before us — let's see what we can suggest for a solution.

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Below are given the number of lineal inches of six staples ¼" thick that can be cut per minute when these better saws are used at the specified speeds:

TOOL STEEL	4½ to 10 Lineal Inches
COLD ROLLED STEEL	8 to 12 Lineal Inches
HIGH CARBON STEEL	3½ to 10 Lineal Inches
CAST IRON	16 Lineal Inches
ARMOR PLATE	8 to 10 Lineal Inches
STAINLESS STEEL	3 to 5 Lineal Inches

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Has powder metallurgy anything to offer you?

Here is a practical study of this fabricating process, its time-saving and cost-cutting advantages.

Its production potentialities are revealed by an expert

Pressures up to 30 tons per square inch are applied to powdered metal to produce parts

Only two basic operations are involved in readying for use a production part made by powder metallurgy. First, the part is formed in a mold, then it is heated. The greatest advantage in this method is the complete elimination of machining operations.

General Motors photos

POWDER METALLURGY FOR PRODUCTION

A Tool Engineer interview with

R. P. KOEHRING
METALLURGIST
MORAINE PRODUCTS DIVISION
GENERAL MOTORS CORPORATION

A LOT has been said and written about metal powders, the parts which can be produced from them, and the advantages accruing to users of such parts. That much can and is being done, and that there are numerous advantages is a statement of fact. But, unfortunately, as with all premature acclaim, the layman has been treated to a generous serving of half truth—and even fiction.

Treated as objectively as possible, it may be said that the use of metal powders is a phase of metal forming and working which deserves much credit and attention today, but it may also be said that problems attend the use and practice of the art. It is a safe assumption that many of these problems will be ironed out, and that powder metallurgy will show more and more progress.

Under the impetus of war production, weapons and accessories to the fighting front are utilizing thousands of parts pressed from powdered metals. These parts are usually mass produced, from powder to finished part without ever reaching the melting point. A minimum of machining is required. At the Moraine Products Division of the General Motors Corporation, a variety of products manufactured includes oil pump gears, self-lubricating bearings, highly irregularly contoured cams, diesel injector filters, and fatigue resistant babbitt lined steel bearings. With the exception of the last mentioned product, all are produced by briquetting and sintering processes.

The mechanical processes in powder metallurgy manufacture are about as simple as any in metal forming, as far as sequence and equipment are concerned. Practically no demand for skilled labor is an advantage.

Metal powder is hopper fed into dies, pressed into briquette form, sintered in temperature and atmosphere controlled furnaces, and, if necessary, re-sized in a final pressing operation. Secondary operations, such as machining, are only necessary when tolerances are required which are closer than those which can be controlled in the sintering operation in view of the dimensional changes which occur during this heat treatment.

Many of the pieces of equipment at the Moraine Division are modifications of pharmaceutical pill presses re-designed to provide the timing and motions necessary for molding metal powders. Others are modified punch presses with hopper feed mechanisms and also with special cams to provide the timing and special motions necessary for this kind of work. The requirements of 30 to 60 tons per square

Small gears are current products of this metal fabricating method

Here are typical parts produced by powder metallurgy at G.M.'s Moraine Products. They can be given sufficient porosity to retain oil.

inch briquetting pressure are met with press capacities ranging from 5 to 400 tons mechanical and 2,000 tons hydraulic where larger area pieces are to be made.

Punch and stripper are cam actuated, the stripper on the modified punch press being required to eject the briquette from the die. Powder is compressed on the average at a ratio of 2½ to 1. This means that the die must have extra room, above the section into which the powder will be compressed, to hold the proper amount of powder. Before the punch descends, an automatically operated shoe travels back and forth across the die, filling it with the measured amount of powder.

Punches and dies are produced from tool steel selected and treated to give high wear resistance as well as toughness in some of the sections of the punches which have sharp edges. Hard chrome plating is resorted to in building up worn portions of dies or punches.

To produce a set of tools for pressing an oil pump gear costs approximately $1500, and life expectancy for these tools may range from 50,000 to 100,000 pieces.

Though a briquette is not strong, handling between pressing and sintering does not require more care than is afforded many machined parts against scratching, or damaging by dropping.

The heat treating operation following briquetting is referred to as sintering. The usual procedure is to briquette powders cold then sinter them in a subsequent operation. These two operations may be done simultaneously where accuracy of dimension is not an important consideration. During the sintering operation a liquid constituent may be present, as in the case of copper and tin powder briquettes, or no liquid may be formed as in the sintering of iron powder briquettes. Sintering temperatures for the copper-tin mixtures are in the neighborhood of 1500° F., which is well above the melting point of tin, but below the melting point of copper. In the sintering operation the tin melts and bonds the particles of copper together.

The sintering temperature for iron is around 2000° F., which is much below the melting point of iron.

(Continued on page 148)

Tolerances obtainable depend upon the shape of parts and press mold designs

Durex Iron oil pump gears are being inspected here as they emerge from the briquetting press at Moraine Products.

After heating in a gas furnace, these powdered metal gears will be ready for installation in vital war products. No machining will be required.

What are the post-war implications of this method?

Briquettes, made by compressing metal powder in a die, are fed into a furnace where they are sintered and heated to temperatures within a few degrees of the melting point of the metals.

When these parts emerge from the furnace they will be finished bearings produced by the magic of powder metallurgy.

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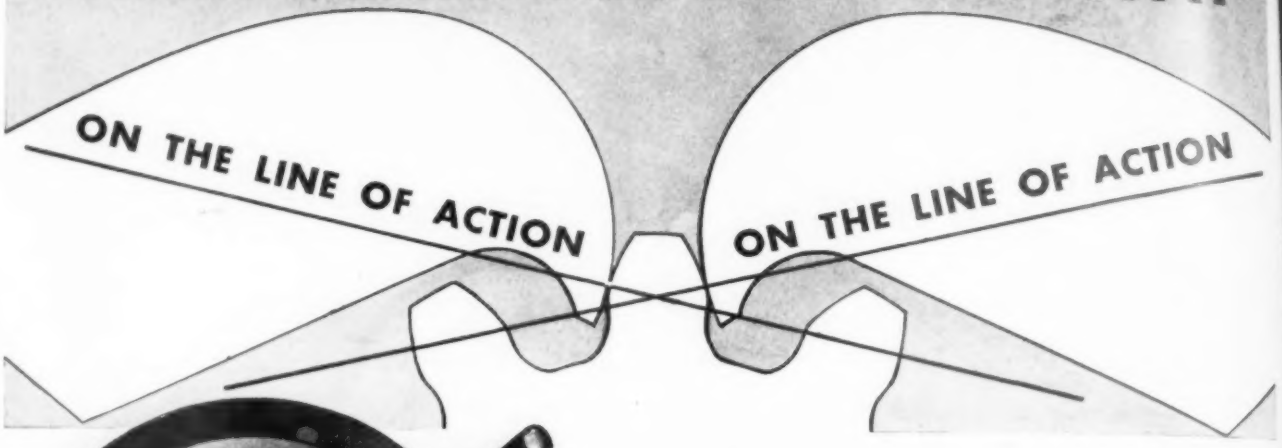

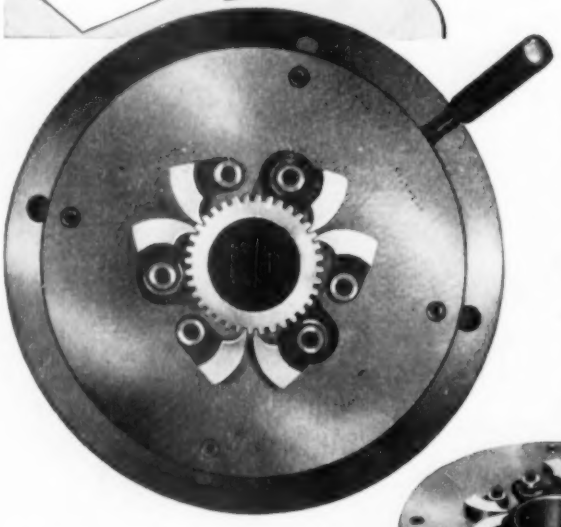

Method eliminates distortion. Gripping action distributed around circumference rather than through diameter. Principle used only in

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ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

Renegotiation: Machine Tool Doom?

RENEGOTIATION MAY KILL THE INDUSTRY UPON WHICH YOU DEPEND FOR MACHINE TOOLS

In throwing its entire resources into the war effort, the machine tool industry may have sold out much of its market for the next decade. Will the government permit the builders to retain sufficient reserves to weather a post-war slump? If it doesn't, your job as a machine tool user some day may be jeopardized by a need for new and improved equipment.

WHAT machine tools will need to be built after the war?

Unlike munitions, machine tools built for war are not expendable. They are equally useful in war-time or peace-time production. And, unlike the consumer industries now engaged in war production while a post-war market for their regular product continues to snowball in size, the longer the machine tool industry works at an accelerated war-time pace in turning out its products the smaller its post-war market will be.

The subject of post-war machine tool demands has become a common topic of discussion among production men. Suggestions are frequently made that the wear and tear of war production on existing equipment will eliminate much of industry's installed equipment, that a huge demand for specialized equipment will exist when civilian manufacture is resumed.

Yet on close study on the subject—examination of the industry's production record by types and numbers of units—it is obvious that more than 90 per cent of the vast supply of modern machine tools can be immediately adapted to peace-time production.

Operations performed by machine tools are common to all production; whether the output is for the manufacture of tanks or street cars, machine guns or radios, battleships or washing machines.

In 1942 the industry sold $1,300,000,000 of its products to makers of munitions, to plants that will return to civilian production come the end of the war. This was 82 per cent more than in the year before, 210 per cent more than in 1940, seven times the sales of 1939, and 14 times the average annual sales from 1929 to 1938, which includes the depression years.

ABNORMAL SUPPLY POSES PROBLEM

Based on the Federal Reserve System of making 1935 to 1939 inclusive the standard period for rating industrial output, 1942 machine tool shipments were more than eight times normal annual sales.

Even if the United States should enter a period of hitherto unparalleled volume of peace-time manufacture, to supply not only its own deferred consumer needs but to aid in the rehabilitation of Europe, the existing supply of machine tools is so enormous that a post-war market for machine tools will be practically non-existent. The absence of a normal market, in the judgment of the builders themselves, will last for 10 to 15 years.

The outlook is grim. But it will not be the first time machine tool builders have been faced with a similar dilemma. A comparable situation occurred, although to a far less extent, after World War One. About 75 machine tool firms failed in the first post-war period. That a substantial number survived, however, is the crux of this article.

They survived then—as some will after this war—by throwing their resources into research and experimentation, by designing new machines so much better, so much more efficient, that manufacturers seeking to cut costs in a competitive market had to buy the new machines even though their war-time models still were operative.

But such programs take time. And they take money. Even after a new, improved model has been developed, it must be tested, introduced and merchandised. Sometimes it requires years to establish a break-even market.

Thus, in the final analysis, the machine tool builder can survive the in-

dustry's traditional lean years only by setting up substantial reserves. Today, the builders are not setting aside such reserves. They can't. Renegotiation of war-time profits before regular taxes not only is wiping out reserves, it is taking part or all of the reserves some concerns had when they commenced the expansion of their facilities to meet the government's demand for more machine tool production.

The industry itself, composed of about 300 concerns, of which fewer than 75 normally make finished machine tools, is not unaware of its fate unless the Federal lawmakers recognize in a revised renegotiation law the difference between profits made by an industry producing war goods unlike its normal production, and profits made by an industry saturating its own market with a war-built product sold at OPA-frozen, pre-war prices.

TAX-MAKERS GAVE LITTLE HEED

Actually, the industry, acting through its National Machine Tool Builders Association, has been very vocal. Yet probably because it represents such a small segment of U. S. business, though basic to all manufacturing industry, it has been able to arouse little concern among those who can really tax it to death.

After hearing proof time and again in documented testimony that individual companies will be unable to re-employ returning soldiers, to even continue operation after the war, a representative of the tax-writing House of Representatives Ways and Means Committee observed, "I agree with you that when your returning soldier applies to you for a job and you send him to Uncle Sam, we on this committee will have the responsibility for the answer that Uncle Sam gives him".

Yet at this writing, nothing has been done by that Committee to permit the industry to establish reserves against a post-war slump or protect the American production engineer against the possibility of meeting world-wide competition in peace-time manufacture with the same unimproved tools he used before the war.

The machine tool industry has gone on record approving the principle of eliminating excessive profits, as well as reviewing contracts to determine to what extent excessive profits may have accrued.

But the industry objects to methods used by the Price Adjustment Boards in their renegotiation procedure. Almost without exception, it has been the experience of machine tool builders to find the Adjustment Boards staffed by men unfamiliar with the financing of a manufacturing business. In one city, The Tool Engineer found machine tool men trying to explain the operation of their business to a board whose membership included a baseball club owner, a real estate operator and a bond salesman. Such are the men who today are a party to digging a post-war grave for the American machine tool industry.

Local Boards have claimed complete authority. Machine Tool Builders have proved otherwise. One representative of the industry told us, "We have proof that their decisions are continually over-ruled by Washington, and that they must secure approval of the government on each case, approval by men who have not talked with the manufacturer, who have or show no understanding of the industry's problems."

"REVISE IT UPWARD"

If the renegotiation demand arranged by the local board does not meet the approval of Washington, builders have learned, the proposed demand is returned to the local board with orders to revise it upward.

Investigations by a manufacturers' association have failed to unearth one instance where agencies in Washington ever advised local adjusters they had been unfair to a producer being renegotiated. Thus, it was pointed out, if local boards do not squeeze enough from a concern's profits, pressure is applied.

And local boards, as well as controlling parent boards in the Capitol, steadfastly refuse to consider the effect of the tax laws on profits after renegotiation. They have refused, builders contend, to consider the basic difference between profits made by a concern which has "converted" to a war product, and profits made from a war-built product which is identical with an industry's peacetime product and saturates its post-war market.

As enacted by Congress, the renegotiation law provides that the manufacturer and the Price Adjustment Board shall come to an agreement as to the amount of the manufacturer's profits that are excessive, and that therefore should be returned to the government. It is assumed that the return is voluntary.

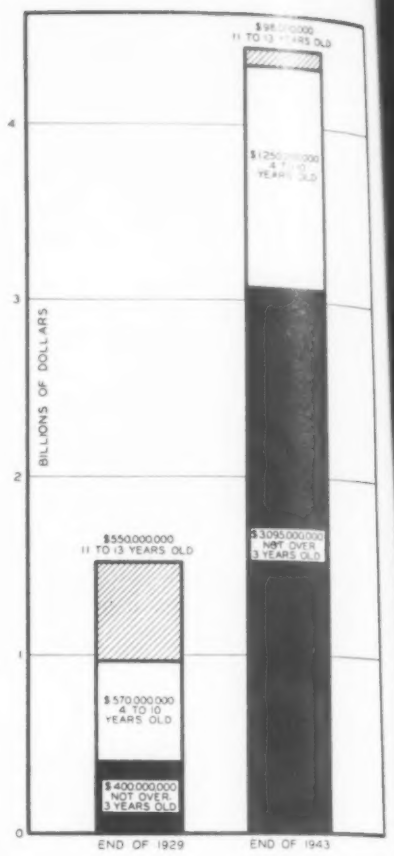
Actually, the builder submits his facts and figures and the Board then determines the amount of money he must pay.

If the builder feels the demand is excessive and declines to sign the "agreement" prepared by the Board, industry representatives have explained, he is told if he does not sign, the matter will be referred to Washington, with the threat that the parent Board there will demand even more.

The Cleveland "News", in an editorial last month, wrote, "Under the present act a court review was impossible once a company had accepted and signed a renegotiation award presented by the board. It is common knowledge that many of these awards were signed under pressure and threats.

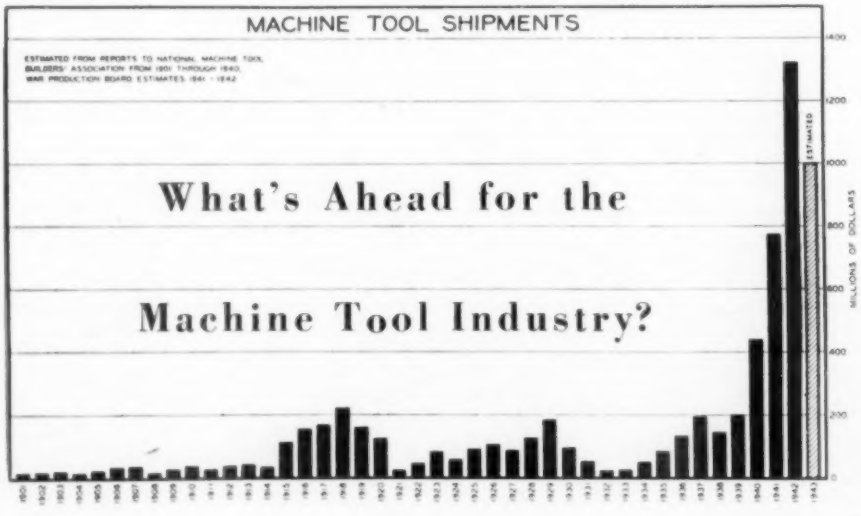
"The amendment should be made retroactive," the newspaper continued, "to permit reopening of these cases and it should have enough teeth to prevent similar tactics being exercised in

(Continued on page 113)



Thousands of war-built machine tools must be worn out or discarded before the builders can again enjoy an average annual pre-war market. Today, twice as many units are in use as in 1929, the previous peak year of machine tool use.

Of what significance was the machine tool industry's record production of more than $1,300,000,000 last year? First, it exceeded the industry's total output of the 10 years preceding the war. Secondly, it was 13 times average peace-time volume. In bolstering the war effort, the industry has saturated its own post-war market.



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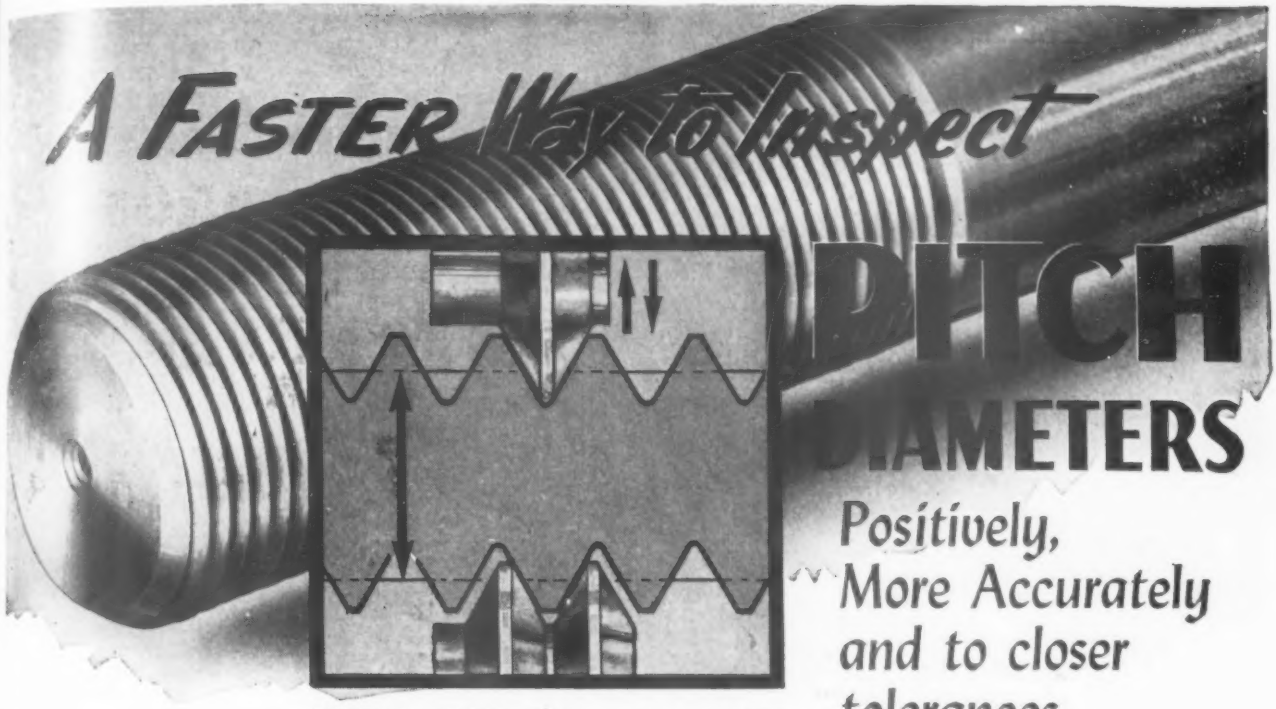
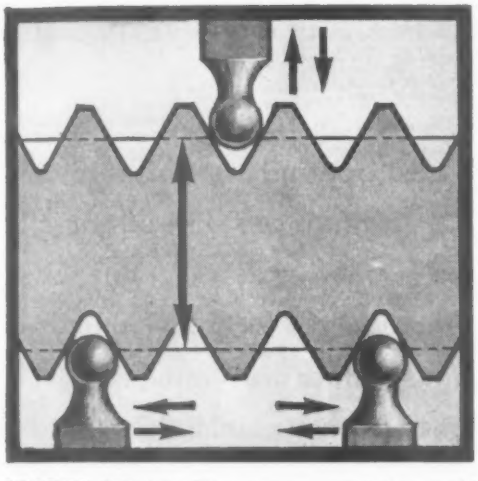


MODEL 45B-100. The upper, sensitive roller contact actuates the Dial Indicator.



MODEL 45B-80. The upper, sensitive ball contact actuates the Dial Indicator. Both lower ball anvils float sidewise independently to compensate for any variation in lead.

No conventional type of gage, whether ring gage or roller-type snap gage, can tell you so **definitely** and so **quickly** the degree of accuracy of a pitch diameter as these two types of Dial Indicator Gages. Neither depend upon the uncertain sense of touch.

The roller type tells more than the conventional roller snap gage because the sensitive upper roller contact, reveals on the Indicator, just **how much** and **where** the pitch diameter may be wrong. The ball type simulates the three-wire method, but is faster. It is accurate to a tenth of a thousandth. Either type is incorporated in the adjustable Dial Indicator Gage shown below. For details write—

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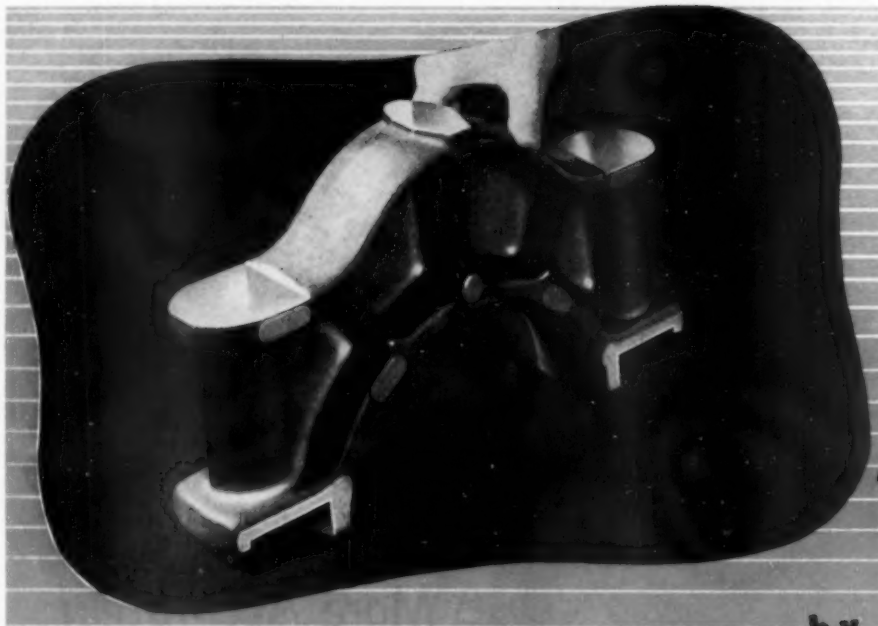
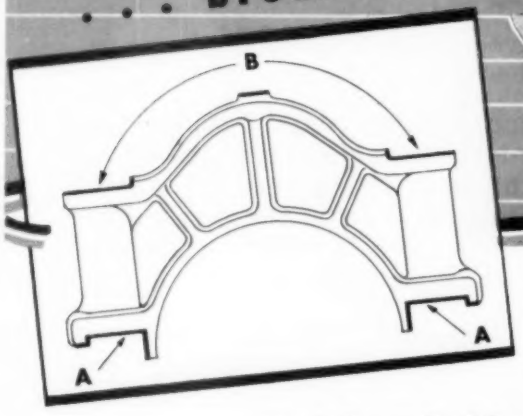
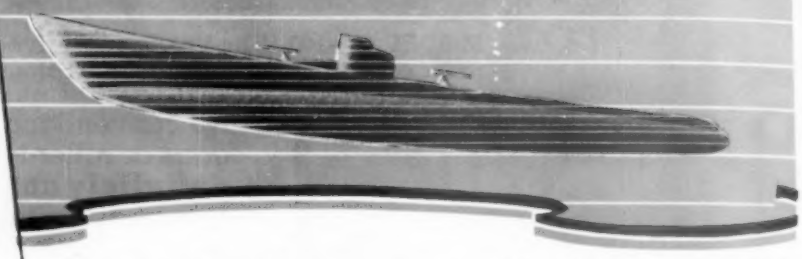
PRECISION MEASURING INSTRUMENTS



THIS UNUSUALLY LARGE BEARING CAP *Broached*

. . . broaches and fixtures by Detroit Broach





Here is where the accuracy and fine finish, so consistently secured by broaching, are desired more than production speed. This marine diesel engine bearing cap is broached from a rough forging that weighs forty-one pounds after broaching. Between three and four pounds of stock are removed. Yet the tolerance is held to .001″ on a 10⅛″ dimension and a good finish is obtained.

The cut was made by three broaches. The first broach roughed the surfaces marked "A" to approximate size in eight passes as the work advanced toward the tool. A finishing broach smoothed these surfaces in one pass. Another broach cut the surfaces marked "B" in one pass completing the job.

The broaches and fixtures used for this work were designed and built by the Detroit Broach Company.

ARMY E NAVY

DETROIT BROACH COMPANY

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9308 SANTA MONICA BLVD. • BEVERLY HILLS, CALIFORNIA

(Continued from page 110)

future. If it merely is a permissive clause affecting future contracts the renegotiators have shown that they have effective ways of coercing industrialists to prevent them from availing themselves of their rights."

When a machine tool builder, or his employees who deserve the protection of a cash reserve for post-war employment, believe they have been treated unfairly by an Adjustment Board, they have no recourse to the courts. The wording of the present renegotiation law excludes that possibility.

The indirect pressure applied on local boards when a producer objects to renegotiation terms handed down is, it has been pointed out, as undemocratic as anything we are fighting the war against.

PROSECUTOR, JUDGE AND JURY

One producer in the industry told The Tool Engineer that he, as well as others he knew in the industry, could not risk going to Washington to speak out against what they considered injustices. Since their own renegotiation cases had not been completed, the penalty for such indiscretion might be more than their businesses could stand.

Thus, the Price Adjustment Board is at once prosecutor, judge and jury.

In its setup for handling renegotiation, the law provides for settlements involving 1942 sales of five million dollars or less to be signed by the local Ordnance Chief. Cases between five and ten million are approved by the Chief of Ordnance. Those over 10 million go to the Under Secretary of War.

Nowhere among these men, another machine tool builder pointed out, has any understanding been shown of the specific problems of the machine tool industry or post-war market implications of the last three years of production.

The insecurity the existing renegotiation law has imposed on the machine tool builder was pointed out by Charles Safford, Secretary-Treasurer, Lovejoy Tool Company, Springfield, Vermont.

In contrast to the unknown factors in renegotiation, where the percentage of government "take" rests in the hands of a group of individuals, he said, "We like the principle of the excess profits tax because we are able to plan the future of our business. We think we can do thus and so, and we are justified in making certain expenditures, purchasing new machine tools, perhaps out of the margin of profits that we know we will have left after taxation."

HOW TO LOSE YOUR SHIRT

But Safford's company, which produces inserted blade milling cutters, an item which is only 50 per cent expendable and is glutting its own post-war market, has learned something of renegotiation. Its case is typical.

At the insistence of the WPB, the concern doubled its production to approach an $800,000 sales volume in 1942. Additions to facilities and inventories necessary to double production required the expenditure of approximately $80,000 of the company's reserves.

Though less than one per cent of the company's 1942 sales at OPA frozen prices were to the government, when its nine months of 1942 business was renegotiated a return of $215,000 was demanded on sales of $776,000.

"Consequently," Mr. Safford explained, "They left us 12½ per cent before taxes, and 2½ per cent on the amount of business. That is, they left us 2½ per cent after renegotiation.

"Therefore," he added, "we put into the business for war expansion purposes more money than our profits after taxes and before renegotiation."

Despite its outstanding contribution to the war effort, made possible without a dollar of government financing, the Lovejoy Tool Company suffered a cash deficit on 1942 business of $14,400. The Company doesn't have the money, Mr. Safford explained, and will have to borrow it to stay in business.

That is the penalty of the present renegotiation law.

James Y. Scott, president of the Van Norman Company, has been active in the industry's struggle to secure congressional action in revision of the existing law. "Taxes are based on a mathematical formula," he said. "But under renegotiation the additional amount to be returned to the government is purely and solely a matter of the judgment of the Price Adjustment Boards.

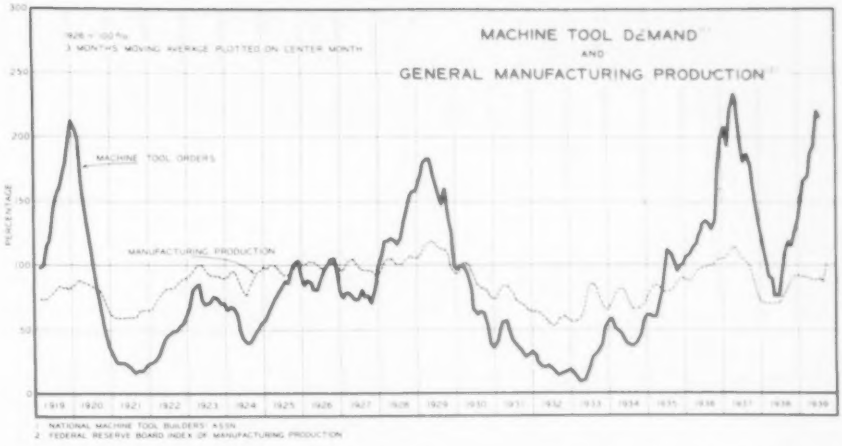
"In short, renegotiation is a matter of taxation by men, rather than taxation by law. No matter how sincere the men administering the law may be, it places in their hands the power to pronounce a sentence of life and death over a company or an industry. This is not the kind of a law we should have in a democracy."

In a formal appeal to Congress, the industry has offered five basic proposals for consideration in any revision of the renegotiation act.

These points, presented by a special committee of the National Machine Tool Builders' Association, are:

1. Recognition of the special problems of the machine tool and other comparable industries as manufacturers of items that will be used in the war only temporarily and will thus for

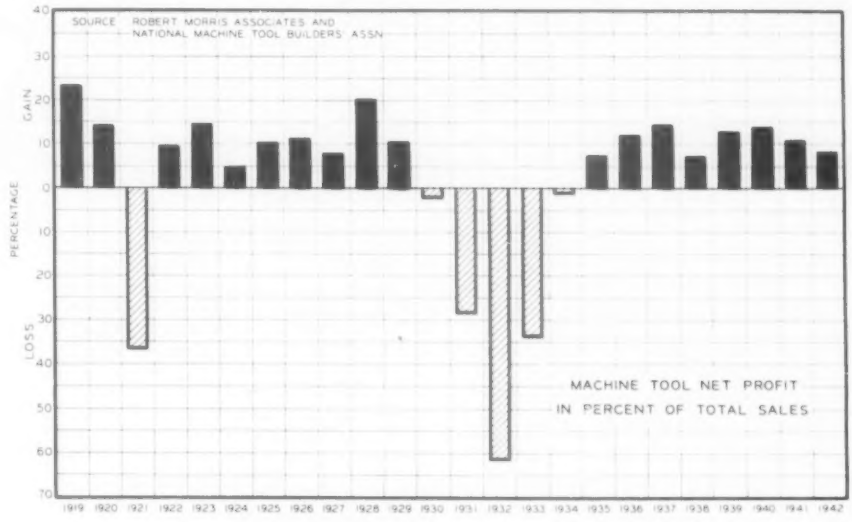
(Continued on page 154)


MACHINE TOOL DEMAND
AND
GENERAL MANUFACTURING PRODUCTION
MACHINE TOOL ORDERS
MANUFACTURING PRODUCTION
PERCENTAGE
1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939
1. NATIONAL MACHINE TOOL BUILDERS' ASSN.
2. FEDERAL RESERVE BOARD INDEX OF MANUFACTURING PRODUCTION

The history of machine tool sales is one of extreme peaks and valleys. For example, the Federal Reserve Board index of general manufacturing production has had a maximum swing of 18 points above the 100 per cent line to 44 points below the line. In the same cycle machine tool orders rose to 180 points, from which they dropped to within eight points of zero.

●

Taxes are as much a cost of production as material and labor, since they determine ability to accumulate reserves necessary to safeguard against the cyclical output. As machine tool profits have never been excessive, as shown below, and losses quickly wipe out accumulated gains, it will also take considerable reserves for the industry to survive this war boom.


SOURCE: ROBERT MORRIS ASSOCIATES AND
NATIONAL MACHINE TOOL BUILDERS' ASSN.
GAIN
LOSS
PERCENTAGE
MACHINE TOOL NET PROFIT
IN PERCENT OF TOTAL SALES
1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942

OVER 600 ATTEND A.S.T.E. SEMI-ANNUAL MEETING

Technical Sessions Highlight 3-Day Indianapolis Conclave

R. E. DAVIS and W. A. SCOTTEN
ASSOCIATE EDITORS

ON furlough from their war-time responsibility of tooling and maintaining production "on the line" in American and Canadian plants, members of the American Society of Tool Engineers gathered in Indianapolis October 10, 11, and 12 for that organization's Eleventh Semi-Annual Meeting.

Record attendance for the Society's mid-year conclave was established when 616 members registered for the series of six technical sessions presented on the last two days. Crowding to capacity the lecture hall of the Claypool Hotel, convention headquarters, top engineers in the field of mass production heard 16 recognized authorities offer practical solutions to technical problems involved in speeding the output and lowering the cost of war material.

Technical session subjects, highlights of which are reviewed later in this article, included New Heat Treat Techniques, Materials Handling and Plant Layout, Gearing and Powder Metallurgy, Tooling for Inexperienced Operators and the manufacture of Allison Engines.

TECHNICAL SESSIONS OUTSTANDING

Douglas D. Burnside, First Vice-President of the Society, expressed the opinion that the technical sessions had equaled or surpassed any presented by his organization. "The basis of these talks was mid-western solutions to trying war production problems now being encountered in every section of the country," he said. "These men were talking right down the alley of tool engineers in this area, and their subjects have reached the apex of interest in the over-all war production effort."

Syracuse, New York, was selected as convention city for the A.S.T.E. Semi-Annual meeting next year, directors of the Society announced after their board meeting October 10. Attended by the entire directorate, including representatives from coast to coast, the meeting witnessed the consummation of plans for an Annual Meeting in Philadelphia next March and authorization of a machine and tool progress exhibition in the Quaker City if conditions warrant.

At the same meeting, money was appropriated for technical services necessary to determine whether the Society will publish a detailed handbook on tool engineering. An analysis and survey of the subject will be presented to the directors for final action at their March meeting, Adrian L. Potter, Executive Secretary said.

MORRIS ON CONVERSION

The post-war responsibilities of tool engineers and the mass-production industries in which they are employed were emphasized at the Semi-Annual Banquet October 11, where the chief speaker was C. Scott Fletcher, representing The Committee for Economic Development. Attendance at the Banquet, presided over by James R. Weaver, executive in charge of the Westinghouse Louisville Ordnance Plant and A.S.T.E. Past President, was near record for any national meeting of the Society.

Offering a new and authoritative approach to the much-discussed subject of conversion to civilian production, Ray H. Morris, President of the Society told The Tool Engineer magazine he believed the transition from wartime to peacetime production "will not be as noticeable as many expect".

Pointing out that many concerns already are embarking on limited parts production for civilian commodities, Morris said "conversion will not be the bugaboo the boys expect. In fact, there may be little lag at all in mass production when war output ceases."

Basing his observations on recent visits to industrial plants in every section of the country, the A.S.T.E. president pointed out how war manufacture is sifting down to production for immediate requirements, with the excess plant facilities being put to work on civilian parts output for maintenance of essential home front services.

Morris cited typewriters and automobiles as typical industries already converting small portions of their facilities to normal parts production. "Here and there in all sections of the country," he explained "you can see a bay or assembly line that was converted for the initial rush of war orders, but is now being readied or already is in use for civilian work."

"For example," he said, "the United States had to manufacture .30 and .50 caliber cartridges at an unprecedented rate. Though we still require 2,000,000 such cartridges a month, they are being produced on the basis of requirements only and the excess facilities resulting from reduced requirements are being reconverted to normal work."

MACHINE TOOL OUTLOOK

On the subject of machine tools, Morris admitted that while requirements for some lines have been amply filled, he said there will be a post-war demand for numerous types of metal cutting equipment. Encouraging from the machine tool builder's viewpoint, he added, is the fact the 24-hour-a-day operation of delicate equipment by novices is wearing them out at an appalling rate, thus making replacements necessary.

Asked about the post-war prospects of mass production and its effect on our national economy, Morris said he is enthusiastic about the country's peacetime prospects. He pointed out that the basis of so-called prosperity is production. "Only if you have full production," he said, "will you have full employment."

Looking to the future, Morris said, "tool engineers have used their intelligence for destructive purposes. Now, they must apply their know-how to con-

(Continued on page 116)

Tool Engineer Banquet speaker, toastmaster and chairman
Left to right: **C. Scott Fletcher, banquet speaker, Committee for Economic Development; James R. Weaver, toastmaster and A. S.T.E. past-president, Westinghouse Electric; and Ray H. Morris, Society president, vice-president Hardinge Brothers Incorporated.**

Visiting notables and A.S.T.E. officers at the head table
Left to right: **C. V. Briner, A.S.T.E. 2nd vice-president, Pipe Machinery Company; Captain G. P. Kraker, U. S. Navy; and Homer Capehart, president, Packard Manufacturing Company.** ***Walking,*** **Floyd W. Eaton, National Treasurer, A.S.T.E.**

Bramson Staff photos

One way trip...to death!

A DEVASTATING MIGRATION occurs at irregular intervals in Norway. Countless hordes of rodents, known as "lemmings," emerge from nowhere. They seem to be led by some invisible Pied Piper.

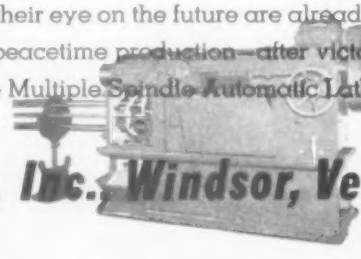
They travel in parallel lines three feet apart, straight through hay and corn stacks, across mountains instead of around... on and on to the brink of the sea. But they don't stop there. They swim straight to a point miles out in the ocean. Then they swim in circles until they drown!

Several theories have been advanced about the fatal pilgrimages of lemmings, but the most likely one is that they are searching for an island which no longer exists. It is an age-old custom: blindly attempting to live by landmarks which disappeared long ago.

The custom is represented by men who hooted at automobiles—by the men who laughed at Wright—and by the men who said democracy couldn't compete with a dictatorship. Happily, those men can be belied by a reliable index—that of the machine tool industry.

We gave Germany a 7-year head start, and passed her in about a year. For every one machine tool produced today by the Nazis, **we are now producing 5.**

The Conomatic, a key machine of peacetime industry, is well known to the production men of America. Those with their eye on the future are already thinking in terms of peacetime production—after victory is won—with Cone Multiple Spindle Automatic Lathes.



CONE Automatic Machine Company, Inc., Windsor, Vermont

Speaker and Officer

Dr. H. B. Osborn, Jr., Tocco Division, The Ohio Crankshaft Company; and A. S. T. E. vice-president D. D. Burnside, Quick Meal Stove Company, Division, American Stove Company.

(Continued from page 114)

structive work.

"Our Allies today will be our chief competitors tomorrow," he continued. "Tool engineers have made this miracle of war production possible. Now they must do it in peace time if America is to maintain its economic leadership among the nations of the world."

In the realm of production itself, Morris predicted a trend to industrial decentralization. "The small war plants which have been built in small towns will be converted to civilian production. Many manufacturing operations formerly performed in centers of concentrated industrial activity will be moved to these little plants after the war. These new shops are better designed, they have better layout and materials handling systems and actual production costs will be lower in them."

Subject of the opening technical session at Indianapolis was "New Heat Treat Techniques". Robert L. Fitzsimmons, Assistant Chief Metallurgist in charge of Armor Plate Heat Treating, E. C. Atkins Company, Indianapolis, was chairman.

SUB-ZERO REFRIGERATION HARDENING

The possibilities of lengthening tool life by sub-zero refrigeration were revealed in a paper by G. B. Berlien, Chief Metallurgist, Lindberg Steel Treating Company.

"We are all familiar with the fact that properly alloyed steels harden when quenched by various means to room temperature," he said. "What then might be the result if we quench to temperatures lower than room temperature?"

The results obtained from tools on production after exposure to sub-zero refrigeration have been so satisfactory, Berlien said, that every heat treat room will some day have mechanical refrigeration equipment for freezing tools after heat treating and quenching.

"Why not insure against tools growing with aging just as gage blocks are protected by freezing?" he asked.

In offering proof of the results of sub-zero refrigeration of cutting tools, Berlien cited tests with tools with stock bits of 18-4-1 or 18-4-1-4 or 14-4-1-4. On a particularly tough job of turning heat treated SAE 2330, results with regularly processed tools averaged 25 pieces per grind, he said.

DETAILS ON REFRIGERATION METHODS

"A bar of annealed 5/8" sq. 18-4-1 stock was purchased and cut to convenient lengths, and .025" was removed from the surface of the bits to remove all mill decarb.

"An atmosphere controlled set of furnaces were used and the bits were racked so as to make 6 bits per heat. They were first preheated to 1525°F., heated through, and transferred to a furnace operating at 2340°F. The bits were heated through when the furnace had returned to 2320°F. and were then quenched in oil.

"The bits were removed from the oil quench when they had cooled to approximately 300°F. and were allowed to cool in air until they reached approximately 200°F. The bits were then transferred to a mechanical refrigerator operating at 120°F. and were allowed to remain there for 6 hours.

"After this period of time they were allowed to resume room temperature normally and were then tempered at 1050°F. for 3 hours.

"After air cooling from the tempering to about 200°F. the bits were again refrigerated at 120°F. for 6 hours and allowed to resume room temperature normally and were again tempered at 1050 for 3 hours.

"The bits were then ground to have the proper cutting angles, and 100 pieces could be turned before these bits required regrinding. This showed an increase in cutting efficiency of 4 times —astounding indeed." We could not, of course establish the truth of such improvement by one run, and therefore, the entire process was repeated several times with very comparable results. A few bits gave shorter runs, but others went over our fondest expectations and we found 100 pieces per grind to be an average figure," Berlien explained.

USES OF INDUCTION HEATING

After describing the contributions of induction heating to war production, Dr. H. B. Osborn, Jr., Research and Development Engineer, Tocco Division, The Ohio Crankshaft Company, hinted at some of the potential post-war uses of this new steel treating method.

The time and cost-saving applications of this equipment in war manufacture, Dr. Osborn pointed out, are certain to find wide application in competitive manufacture after the war.

"Some of the outstanding applications of induction heating recently made," he said, "has been in the brazing of chemical shells and incendiary bombs, heating of shells for forging and the heat treatment of armor piercing shot. The benefits afforded the war effort have been nothing short of phenomenal".

SAVINGS WITH INDUCTION EQUIPMENT

Dr. Osborn pointed to several specific savings in cost and time in war production which have definite post-war implications. The first was a saving of $1.00 per unit in surface hardening the teeth of 1045 steel sprockets. In flame hardening these sprockets, the labor, overhead and fuel costs averaged $1.30 per unit. The equipment necessary to turn out 800 per day amounted

(Continued on page 141)

Indianapolis semi-annual technical session speakers

Left to right: **W. P. Schmitter, technical speaker, Falk Corporation; A.S.T.E. Secretary E. V. Johnson, Firth-Sterling Steel Company; and C. G. Pheffer, another technical speaker, Wright Aeronautical Corporation.**

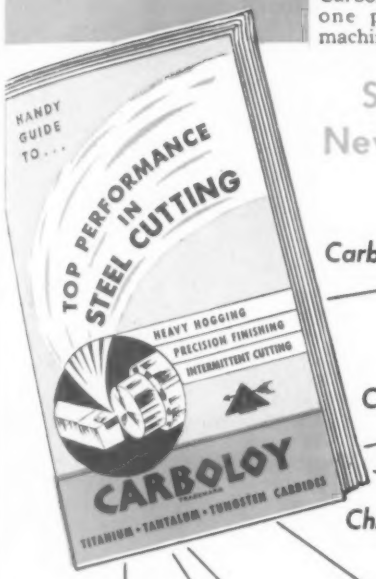
Materials handling and plant layout problems discussed

Left to right: **R. W. Mallick, Westinghouse Electric and Manufacturing Company; A. E. Rylander, Tool Engineer Technical Editor; L. J. Bishop and W. V. Casgrain, Mechanical Handling Systems, Incorporated, discuss plant layout problems.**

Bramson Staff photos

Guide to Top Performance when Cutting Steel

Turning, boring, facing steel supercharger gears. Carboloy tools eliminate one pass; save 81% machining time.



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Carbide Grade Selection

Correct Cutting Speeds

Chip Breaker Design

Tool Rakes and Angles

Machine Requirements

Use of Coolants

"Do's and Dont's" for Operators

For top performance when you cut steel with carbide tools ★ Cut at high speeds, in general, not less than 200 feet per minute ★ Use feeds not less than .010" per revolution (for medium and heavy cuts), and preferably .015" to .025" ★ Fit correct chip breaker to each job (the ground-in, step-type is usually best) ★ If you use a coolant, provide heavy, continuous stream ★ Keep tools sharp (excessively dull tools cause breakage) ★ Use rigid set-ups; with minimum overhang, and part chucked firmly. These factors are particularly important for best results.

Important, too, is the type of carbide you select. Today, more than 60% of all Carboloy Cemented Carbide produced for machining purposes is used for cutting steel. In leading war plants throughout the nation—you find Carboloy tools giving top performance on all types of steel cutting, ranging from extra heavy jobs to light, high-speed precision finishing.

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RYLANDER REPORTS ON:

THE A.S.T.E. CONVENTION

CLICK! The months have ticked off like so many minutes since we convened in Milwaukee. And, since one town is like another from Depot Square to Hotel Plaza, one meets auld acquaintance with the outward casualness evinced toward the members of one's household. They're taken somewhat for granted, missed if they don't show up.

At that, there's always the thrill of meeting a long lost "brother". As for me, I took a 5-mile const'l before b'fast and saw Indianapolis on the hoof. Nice town! Courtesy, friendliness, welcome signs for the Tool Engineers. Strauss & Co. had display by Chas. Drexler Company. Fine showing of gears by Indiana Gear Works in Lincoln lobby.

A rump com'tee session the evening of arrival, then out for a nightcap. Beautiful women and plenty of 'em, including Waacs and Waves. Uniforms everywhere. Flaming youth winding up the wee hours five deep at Thompson's for coffee and sinkers.

NEW AND OLD FACES

Sunday, Directors meeting. A few new faces among the veterans; a few of the latter—including Larry Radermacher—back after an absence. All there but Bill Asmus of No. 18; anyway, I don't recall seeing him. Steelman Frederick of Cinci sustained his rep as the Great Crystalizer, although all discussions were streamlined like a futuristic plant layout. Fine innovation, that, having preliminary review and condensation of all reports by the Resolutions Com'tee. It acts like scissors, cutting red tape and dragged out debate. Had an eye on our new Justice, Irv. Holland, who disposed of Const'n & By-laws with speed 'n dispatch.

Incidentally, had a hint of a judiciary Com'tee consisting of the nine oldest past presidents. So, we have "nine old men" to guard over A.S.T.E. democracy. At luncheon, reminisced with Horace Wentzell about old Chicago.

PREXY LIKE AMBASSADORSHIP

Detroit had a gallery at the Senate, consisting of No. 1 officers Geo. Whitehouse, Jack Delaney, Ray Farmer and Paul Passmore. In all, it was the best Dir. meeting I've ever attended, the boys getting out before supper 'stead o' in the sma' hrs. of the morning, as in the old days.

Committee work has been excellent during the present year, and Ray Morris has justified all my predictions that he'd make a fine president. At that, being prex of the A.S.T.E. is getting to be like an ambassadorship to the Court of St. James; a guy's gotta live beyond his income. Not so good, that, and we'll just have to arrange so that a poor man can hold the Chair in the future as in the past. We grew that way.

Sun. eve., Chapter officers School, when local leaders were coached in the fine points of running their Chapters. They all took it seriously, the various Nat'l. officers and ch'men each outlining the work in his own field. (Me, I'm lucky, don't have to make any long speeches. Just write 'em longhand, and let the readers worry). Rump sessions to the small hrs., but up betimes for meeting with Editorial Com'tee.

Rip Collins, who (like the rest of us) says that getting busy tool engineers to write articles is like milking a dry range cow, provided an interesting diversion with an account of oil well drilling. Thar's romance in them thar holes, men!

LUNCHING WITH EXECUTIVES

Rip and Milt Roessel were the only Area v. ch'men present, partly due to conflicting sessions. But E. S. Johnson batted for Bob Gillette—and did right well, thank you—and a comer by name of Gene Bertschi from Peoria will bear watching for future developments. Later, talked things over with Al Mitchell (incidentally, sent greetings to friends in Syracuse) and met Bill Dawson at the final conclave at the depot.

All's well that ends well, and all present assured me that the entire A.S.T.E. commends The Tool Engineer for its progressive improvement and high quality. Well, we know it's good, although we're not bragging. Thankful, rather, having worked hard to make it that way.

With the Mon. A. M. technical session in the offing, I was looking all over'l for Pop Hiatt. Ran into a young squirt whose face looked familiar and asked him had he seen Pop. "Why, that's me," sez he, and sho' nuff it was, only he'd got himself rejuvenated or suthin'. Looked fine! Had lunch with him, Jack Hawkey, Doug Burnside and Ade Potter, together with Messrs. Ezra Clark of Clark Tructractor, 'Dolph Mallick of Westinghouse, and Casgrain and Bishop of Mechanical Handling Systems, all as a get-together prior to the Materials Handling & Plant Layout session.

Bramson Staff photo

A. J. Langhammer, president, Amplex Division, Chrysler Corporation *(right)*, and A. E. Rylander discuss powder metallurgy at A.S.T.E. technical sessions.

Jack Hawkey, incidentally, complimented me on the philosophic tone of the Handy Andy column, by which I infer that a bit o' serious seasoning goes a long way sometimes.

The Session, at which I was privileged to preside, was packed with the interested. All the sessions were, for that matter, although I couldn't attend every one beyond a peek-in. Mr. Mallick is an excellent speaker, with nicely coordinated subject matter, and Mr. Clark is a veteran engineer who is at once an orator and an orator who has something to say. (Seems he's been overseas helping Uncle Sam with his transportation problems). Messrs. Casgrain and Bishop were last minute pinch hitters who delivered the goods.

FOOD, FACTS AND FUN

First time I ever considered the processing of hides (among other things) as a field for tool engineering. There's just no end to our field! Anyway, my personal vote of thanks. At that, we all received Ctfcts. of Appreciation for our talks, and everyone got ideas and inspiration for streamlining post-war production.

Monday nite, the Big Banquet, past prex Jim Weaver doing the toastmastering. First time I've seen Jim since he became mgr. of Westinghouse Ordnance, but he's the same ol' Jim and bearing up well under responsibilities.

Local greeter for the City of Indianapolis and the State of Indiana was Samuel C. Hadden, of Indiana State Highway Com'n. Pinch hitting for the Governor, he mildly suggested that, because of a mike developed by electrical engineers a civil engineer was able to talk to some six hundred tool engineers. Yessir, men, the rest of the engineers are there, too, so let's not grow out of our pants too quick.

Guest speaker was C. Scott Fletcher, Dir. of Field Development, Com'tee of Economic Development, Washington. He had plenty to say, and said it exceedingly well; has a message that should be broadcast throughout the U. S. A. Speaking on post-war production, he held for employment at gainful wages as the way to preserve the American Way.

LET'S PLAN FOR PEACE

I'm for the guy all the way, but couldn't help wondering why we, as a body of engineers, haven't started plans to cushion the economic shock of armistice. Sure, we'll be there tooling for peace as we've been tooling for war, but for gosh sake let's get in there and start the ball rolling!

Met a nice young fellow at the banquet, Lee Baker of United Press. Told him it's time the public becomes aware of what the tool engineers are doing as doctors of know-how. (Incidentally, I'm reserving rights to that title, for

(Continued on page 142)

Danly Die Sets are not products that get to the front. Their job is in a thousand factories in the presses that stamp out and form parts for all branches of the service.

They are products for a thousand end uses. They are aiding American Industry to produce ordnance and equipment enabling American Fighting Men to win the war.

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MACHINE TOOLS

. . . news and trends in the Machine Tool Industry . . .

Industry Outlook: Net New Orders Rise for One Month; Shipments Off

In August, and for the first time in months, the industry witnessed a substantial rise in net new orders — the difference between total orders and cancellations.

A final compilation of industry-wide figures by the Tools Division of the War Production Board shows that August net new orders totalled $33,378,000, while the July figure amounted to $28,713,000. Thus, net new orders for August increased 16.2 per cent over the preceding month.

Down Trend: Nonetheless, the downward trend in machine tool production continued throughout mid-summer and unofficial figures gathered by The Tool Engineer Magazine show that output still was on the toboggan in October.

The full effect of the WPB axe, threatened in early summer, is now being felt in new industrial plant facilities. Machine tools is no exception. Shipments of machine tools for August totaled $87,827,000, a decline of approximately 10 per cent in value from the July total of $97,541,000. Machine tool figures for August are interesting, for despite the fact that net orders for the month totaled more than those for the preceding month, total orders received were down 3 per cent, from $41,447,000 to $40,192,000. Explanation of the final total is the fact that cancellations of $6,814,000 for August represented a decrease of 46.5 per cent from July cancellations of $12,734,000.

Likewise, the backlog of accumulated orders at the end of August continued to decline, dropping 12.3 per cent. The figure in July was $441,220,000, for August $386,792,000.

But, as conversion of the industry's productive facilities to direct war work continues and shipments drop accordingly, the estimated time necessary to clear the backlog remains the same. At the August rate of shipments, the last page in the order book would be marked "filled" in about 4.5 months.

J. Y. Scott Elected President of National Machine Tool Builders'

At its 42nd annual meeting in Chicago, October 11, the National Machine Tool Builders' Association selected as its new president J. Y. Scott, president of the Van Norman Company, Springfield, Massachusetts.

Joseph L. Trecker, vice president of Kearney and Trecker Corporation, Milwaukee, was elected First Vice President of the Association; and William P. Kirk, vice president and sales manager of the Pratt and Whitney Division of the Niles-Bement-Pond Company, West Hartford, Connecticut, was elected second vice president of the machine tool organization, E. Blakney Gleason, vice president of the Gleason Works, Rochester, New York, was named treasurer.

New directors chosen for a 3-year term at the Windy City meeting were Kirk; C. N. Kirkpatrick, president and general manager of the Landis Machine Company, Waynesboro, Pennsylvania; and R. E. LeBlond, president of the R. K. LeBlond Machine Tool Company, Cincinnati.

New Models Indicate Post-War Market Approach

In what may be the first post-war machine tool market approach, Continental Machines, Incorporated, Des Plaines, Illinois, has announced 22 new machines which it has ready for introduction to the metal cutting industry. The models were revealed recently at a company sales convention.

Past Peak: The company and its affiliates reached peak production of its tools for war industry in August 1942, and is now operating at about 40 per cent capacity, or at about 1937 levels, it was reported.

The new machines are all improvements or developments of the company's contour sawing and filing machines known as the Doall.

Sundstrand Converts; Looks to Hydraulics for Business

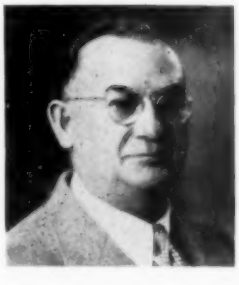
More conversion news has come from the machine tool center of Rockford, Illinois, where the Sundstrand Machine Tool Company has announced that it has under way a program of conversion to other strategic war material.

Hugo L. Olson, president of the company, first revealed the plans recently in a statement to stockholders.

Hydraulics: While the concern's unfilled machine tool orders have declined since the first of the year, orders for hydraulic devices have made up the difference and the company's backlog of business is at practically the same level as on January 1, 1943, the president said.

"Sundstrand is no longer a 100 per cent tool builder," Mr. Olson said. "Developments indicate that the hydraulic department may well become the most important part of the company's business. At present various hydraulic devices are being used in increasing amounts for the war effort and the company is about to receive large additional orders," he stated.

Sundstrand shipments for the first six months of 1943 were valued at $9,422,884, up 33.3 per cent over the same period last year, it was learned.



Industry Mourns Passing of William R. Beatty

In the death of William R. Beatty, the machine tool industry lost one of its prominent figures.

Beatty was active until his death in management of the Beatty Machine and Manufacturing Company, which he founded 26 years ago.

His position is filled by his son, L. C. Beatty, president of the company, and active in the business for the past 12 years.

Cutting by 60 per cent the time required in milling and boring compressor beds at the Cooper-Bessemer Corporation, this 131-ton Ingersoll open side machine has a variation from horizontal in its 26-foot-long bed of less than .003-inch. Portable remote control with 13 buttons permits tool adjustment to within .001-inch.

Van Norman Name Change in Keeping with Varied Products

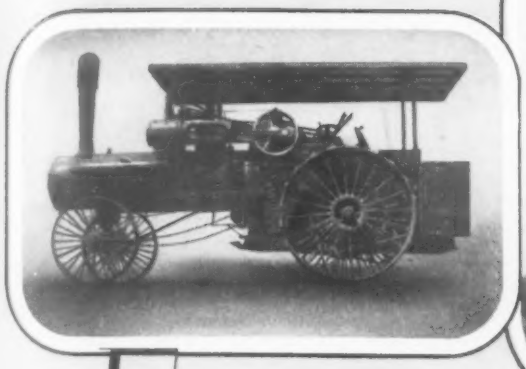
Corporate name changes often are bellwethers of projected activity. Consequently, the recent change from Van Norman Machine Tool Company to "Van Norman Company" has been viewed by the trade as a post-war indicator.

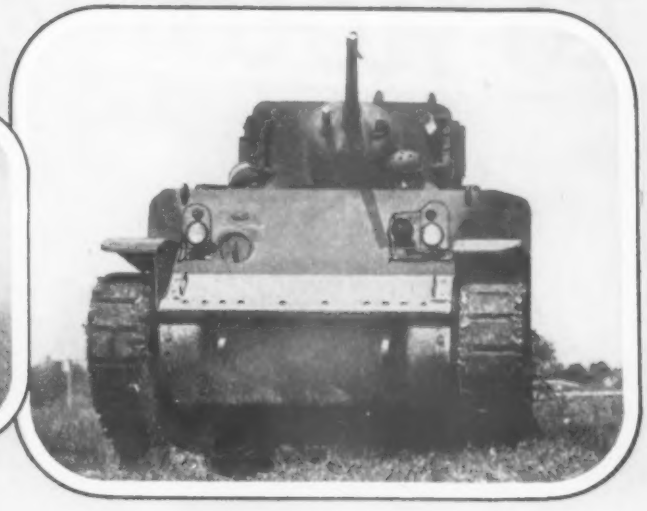
In a subsequent announcement, the Springfield, Massachusetts, concern left no doubt about the matter. The old name was adopted when the company was formed in 1912, and when the company's activities were devoted for the most part to the production of machine tools.

New Products: In past years, the concern's activities have been expanded to include production, on an increasing scale, of automotive service equipment and, more recently, products associated with the field of electronics. A notable war-time Van Norman development has been a line of induction heating equipment.

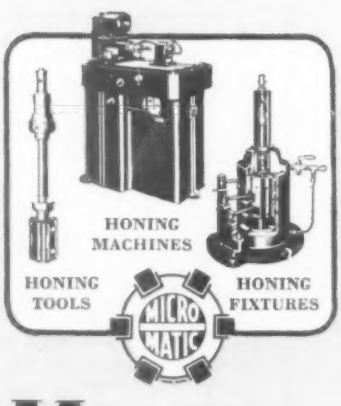
The purpose of the change of name to "Van Norman Company" is to abbreviate the present corporate name; it was announced, and "to eliminate the implication that the activities of the company are or will be confined solely to the production of machine tools."

Otherwise, it was said, the change in name voted by the stockholders will have no effect upon the organization or its policy. THE END





From plowshares to SWORDS ...TO PLOWSHARES



Micromatic

HONE CORPORATION

Detroit, Michigan

Yesterday—*The steam "traction engine" gave way to the gas powered crawler tractor just in time to suggest the World War I tank. It was only a crude, slow moving offensive weapon, but it promised tremendous tactical advantage. Only the use of early abrading processes made it possible.*

Today—That swift powerful engine of destruction—the modern tank—is the product of many years of combined experience in ordnance and automotive practice. Honing, the advanced abrading process, is of utmost importance in making possible this modern beating of "plowshares" into "swords".

Tomorrow—Our "swords" must again become "plowshares"—war developments always produce technological advances usable in peace. What these advances may be, we can only guess. But the fundamental process of Microhoning will be ready with new refinements to meet these needs.

This process which generates bore accuracy for roundness and straightness within .0002" to .0003"—which removes up to 65 cubic inches of stock per hour, has been developed into many ramifications, now being used for war machines. Tomorrow they will be available to speed peacetime production.

MAKERS OF HONING MACHINE TOOLS

to hold that line—

OILGEAR

In this welding positioner Oilgear Fluid Power solved 6 difficult design problems.

on a 50-ton steel shape or on a sheet of cellophane

THERE is a world of difference between holding the hairline register in printing flimsy cellophane and holding a line in the automatic welding of a 50-ton steel shape. But the fact that Oilgear Fluid Power has solved these and far more varied problems makes it seem certain *your* particular problem will yield to the versatility and flexibility of this proven power application system.

Here are just a few of the functions Oilgear Fluid Power will provide . . . steplessly and infinitely variable speed control of moving members . . . force *without* movement . . . a simple means of applying great power . . . the synchronizing of a number of motions . . . perfect sequence or cyclic operation.

For a quarter of a century Oilgear Engineers have applied these and other Oilgear Fluid Power functions to hundreds of different machines and mechanisms in hundreds of different ways . . . with results which often have been amazing. Oilgear Engineering know-how and Oilgear Fluid Power adaptability may provide just the answer you are looking for in that machine you are going to bring out. Now is the time to see. The Oilgear Company, 1308 W. Bruce St., Milwaukee, Wis.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R P M or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

OILGEAR

Fluid Power

CAPITAL COMMUNIQUE

T.M. REG. U.S. PAT. OFF.

T. N. SANDIFER

Special dispatch from **THE TOOL ENGINEER'S** *Correspondent in the nation's capital.*

BOTH Congress and the war agencies have just been given for the first time a close-up of what machine tools have done, and are doing now, in the war, and what must be done to assure enough equipment and its efficient operation in the coming war-year.

The first part of this picture, as to the place of machine tools, and the men who design them and operate them, in the war effort, was given to members of Congress by industry spokesmen, incidentally to comments on pending legislation that would modify renegotiation proceedings.

Thorvald S. Ross, president of Rivett Lathe & Grinder Company, of Boston, in urging that the industry be treated in such a way as to insure its continued existence in readiness for future contingencies pointed out that in the present war "Britain has depended on us for its re-arming; Russia has depended on us for its re-arming," and that without an efficient going industry of trained men, research, and tools, "the next time the enemy strikes you on both coasts you are going to be licked, because without the machine tool industry, the United States, England and Russia are going to be defeated.

THE KEY TO MASS PRODUCTION

"Our industry is relatively small, but it is the key, because you could not make one cartridge, one part of an automobile, or an airplane, a bomb-sight, or anything else, without machine tools, and since we must have machine tools, we must preserve the builders of machine tools. You can't do it overnight. It takes years and years."

Probably for the first time in many instances, members of Congress now know what a machine tool is. Another machine tool man, Charles N. Safford, treasurer of Lovejoy Tool Company, Springfield, Vermont, was the mentor in this instance. His firm makes a line of metal-cutting tools of the inserted blade type. Holding up a picture to some committee members he was talking to recently, he told them:

A LESSON FOR WASHINGTON

"There is a milling cutter which is the chief article of our production. The body itself is not expendable, it lasts about 20 years. The blades are expendable. I would say that tools of this type do one of the vital operations on all of the airplane propellers made of aluminum alloy, and so forth, made in this country.

"These tools have to be the equipment for milling machines and boring mills and production lathes; that is the machine tool couldn't function if it didn't have the small tools to work with, just as we have to have a pencil and pen to write with."

Old stuff here, of course, but it helps the people in Washington to know what machine tools actually do, and a lot of people in this town did not know.

Rounding out the situation on machine tools and the industry at present, is the following summary, which was presented by T. S. Ross, who besides speaking for Rivett Lathe & Grinder Company, when here, represented the National Machine Tool Builders Association;

IS THE MARKET SATURATED?

The industry, under force of war demands, has been making machines at many times the normal rate, in some cases ten times or more, as fast as a regular market would absorb them. The market for machine tools will be flooded at the end of the war with tools that probably will not have to be replaced for perhaps 15 to 20 years.

On this point a conclusion of special interest here is that while in general machine tools are good for about 20 years, the probable mishandling due to war and inexperienced manipulation may reduce this expected useful period to nearer 15 years. In contrast, for illustration, to the outlook of the automotive industry, besides the fact that machine tool builders face a loaded post-war market, the public is already turning back what has been described as "vast numbers" of machine tools. Cancellations, almost entirely unknown in peace time, are running well over 20 percent.

The industry spokesmen who have talked here have stressed that an important factor in their planning is a desire to keep skilled men in the industry, and to provide waiting jobs for the men who have gone from their plants to war, when these return. The substance of their position is that Congress consider all these conditions in their industry in shaping any pending legislation on renegotiation.

Industry representatives have just given War Production Board the second half of the picture sketched in the beginning of this article: the current position and the outlook for 1944. Some significant highlights are these;

About $325 million in new machine tools will be required for 1944 war production, roughly one-third of the probable 1943 figure, and about 25 percent of the output in 1942. Even so, the 1944 requirements are still double the output of a "good" peace-time year.

LET'S LOOK AT THE RECORD

The record of the machine tool industry in meeting war demands is shown in the industry's shipments.

Average of the years 1929-38, $100,000,000; in 1939, $200,000,000; 1940, $440,000,000; 1941, $775,000,000; 1942, $1,321,000,000; 1943, $1,181,000,000.

In respect to the 1944 requirements, Ralph E. Flanders, chairman of a subcommittee of an industry advisory committee for the Machine Tool Industry, advised the Director of the Tools Division of WPB, that "It is our belief that the industry cannot make long-term commitments required for producing this volume of output" and enumerated the following industrial factors: the natural decline in machine tool orders, the pressure from many directions to take other work; difficulty of producing machine tools in smaller volume under OPA price ceilings; discontinuance of new pool orders, and threat of unabsorbed inventories, all of which are turning machine tool builders to manufacture of other products.

PLANS FOR TOOL OUTPUT

Preliminary to making an important recommendation to WPB on the whole problem, he continued:

"The time has arrived when thought must be given to the threat to the war program inherent in this situation. Machine tool builders who have converted most of their facilities to other war work cannot be suddenly reconverted to meet unexpected machine tool demands. The process takes months."

In order to assure continuity of production of these vital tools, the subcommittee has recommended to WPB, a system of Government control of the industry's production.

(Concluded on next page)

FROM THE WASHINGTON VIEWPOINT . . . .

- Congressmen and many a war production administrator recently got their first close-up of the role machine tools have played in the war effort, are beginning to understand the industry's dreary post-war market outlook.
- To assure continuity of production of tools for industry, a system for government control of the machine tool industry's output is being considered by WPB.
- WPB thinks machine tool men should help salvage costly specialized equipment, breaking down, re-assemblying and re-tooling such units to handle new jobs.

We're Always "STICKING OUR NOSE" into the other fellows business

•ON INVITATION

YES, McKinney tooling engineers are welcome guests at many important conferences — invited in to consult regarding manufacturing plans and objectives.

•

They bring to these meetings expert knowledge gained through 20 years of experience in the development of equipment to assure rapid, efficient and economical production.

McKinney services vary with the needs, and may entail—the designing of new tools, jigs and fixtures—building of equipment to customers' plans—plant layout and routing—recommendations for more resultful use of present equipment—or, advance plans covering post-war production.

•

Consultation is available without entailing obligation. As an introduction to our services, write for the new bulletin featuring McKinney services and facilities.

McKINNEY TOOL & MFG. CO.
CLEVELAND
DESIGNERS and BUILDERS of PRECISION TOOLING
Since 1920
1671 ARABELLA ROAD
Tools·Dies·Jigs·Fixtures·Special Machinery

—CAPITAL COMUNIQUE—

(Continued from preceding page)

This recommendation is now before WPB, and so far, no action has been taken on it, but the whole problem is under study here. There has been nothing public on this recommendation, accordingly, but some of its principal features hold wide interest, and it is possible to give some of them here.

"POOL OUTPUT" PROCEDURE

The system of Government production control would resemble the "pool order" procedure of Government guarantees on production, that was in effect for some time, aimed at increasing production, but for the present purpose the plan would be the reverse in effect, namely, its aim would be to control and limit production of machine tools. The machine tool builder, under the suggested system, would submit his order board to the Tools Division of WPB, reporting his unfilled orders, the trend in demand, size of manufacturing lot he must produce in his shop on each size and type of machine.

The Tools Division would recommend a Defense Plant Corporation order underwriting this production, and increasing or decreasing the schedule as seemed warranted. In event of cancellations, the number under manufacture would not be changed, but the cancelled machines would be assigned to the next order for that size and type. The production schedules would be at all times under review and subject to controls to meet current needs.

This plan, if adopted, it is hoped will meet a situation in which production is leveling off all along the line, but in which equipment has to be ready to meet new demands from a war that is still going on, full blast.

RE-TOOL SPECIALIZED UNITS

The Tools Division has suggested to industry men a number of collateral tool problems that have arisen in the present emergency. While any action taken on this particular one is probably going to be too late for the war, the division is seeking industry cooperation in standardization of chuck spindle mounts, to avoid a situation that has led to having plenty of chucks available, but not interchangeable due to lack of standardization of spindles.

Another problem involves salvaging costly specialized equipment. The industry has been asked to think about the possibilities, when such items are needed, in breaking down, re-assembling and re-tooling such specialized units for the current purpose.

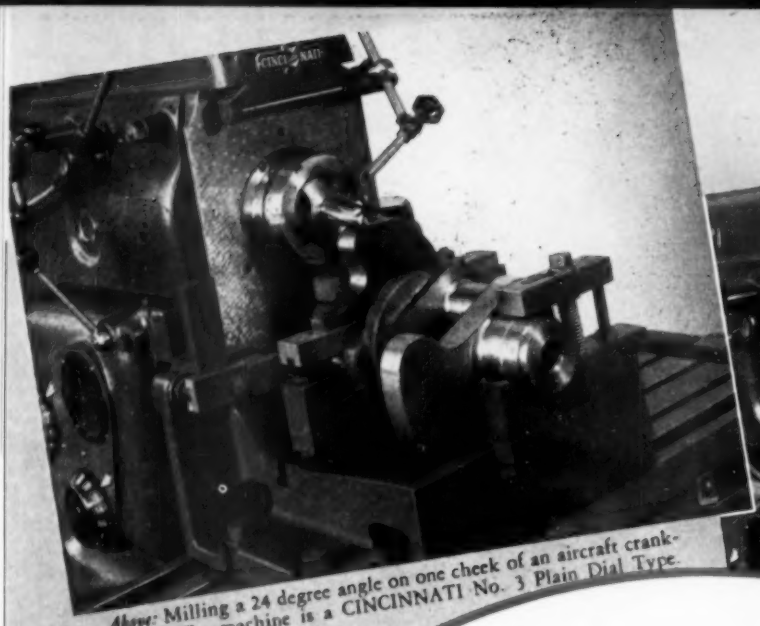
The industry has also been asked to watch for trouble-making equipment, and where items are known in this category, to correct the situation both as to machines for future shipment, and those in present use.

A tool manufacturer commenting here on the durability of machine tools and auxiliary parts, pointed out that his company is now selling plates for milling cutters that were manufactured 20 years ago.

This illustration helped to explain why so much of the equipment now in use will still be working for a decade or more after the war.

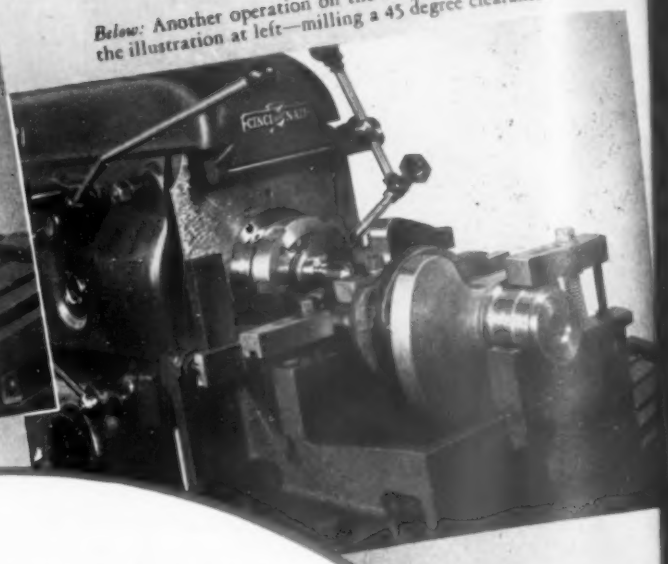
THE END

Special
HIGH SPEED STEEL
CUTTING TOOLS
A mature all inclusive organization devoted to the designing and manufacture of special form, milling and all types of metal working tools . . . Right here in the home of high speed precision production, we have kept pace, and anticipated many of the requirements of this kind of tooling . . . Send for new sixty page catalog.
U.S. TOOL & MFG. CO.
6906 KINGSLEY - DEARBORN, MICHIGAN
Established in nineteen hundred and



Above: Milling a 24 degree angle on one cheek of an aircraft crankshaft. The machine is a CINCINNATI No. 3 Plain Dial Type.

Below: Another operation on the same part shown in the illustration at left—milling a 45 degree clearance.



THIS EQUIPMENT SAVES SET-UP TIME

...in Several Ways

• The CINCINNATI No. 3 Plain Dial Type Miller and the CINCINNATI engineered fixture — shown in the two illustrations above — team up to handle two distinct milling operations on aircraft crankshafts with a minimum of set-up time.

In the first setting, a 45° clearance is milled for a bearing collar. At the completion of this operation, adjustable fixture elements are rearranged, the cutters changed by means of the quick change collet, the work adjusted to the cutter, and everything's all set for the next operation of milling a 24° angle on one cheek.

Several machine characteristics contribute towards the economical production of these parts: the **right speed** for the type and diameter of cutter, quickly selected at the front (or rear, if desired) and without effort . . . the right **feed** for the material and cutter, quickly selected at the front (or rear, if desired) and without effort . . . rapid adjustment of work to cutter with three way power rapid traverse.

Time-saving teams of fixture and machine are specialties with CINCINNATI Service Engineers. They'll be glad to analyze your milling problems, and you may be sure that they will offer a solution which will please you.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES... SURFACE BROACHING MACHINES... CUTTER SHARPENING MACHINES

INDUSTRIAL NEWS DIGEST

. . . a review of significant developments and new techniques in mass production industries . . .

Four Societies Cooperate in National Metal Congress

Chicago — Technical developments and production advancements, detailed in more than 100 papers presented by four cooperating societies, highlighted the 25th Annual National Metal Congress and War Production Conference Display here during the week of October 18.

Awards: Roy A. Hunt, president, Aluminum Company of America; and Dr. Zay Jeffries, technical director, lamp department, General Electric Company and chairman of the board, Carboloy Company, were recipients of special awards presented by the American Society for Metals.

Hunt received the A.S.M. Medal for the Advancement of Research, while Dr. Jeffries received the Society's Gold Medal as a recognition of his outstanding metallurgical knowledge and of his great versatility in the application of science to the metal industry.

Under the guidance of Hunt, "Alcoa" has been a leader in the research and technical development of a metal which has had its entire industrial growth in the past 55 years. By consistently sponsoring research and development, Hunt has helped substantially to advance the arts and sciences relating to metals, A.S.M. officials stated.

More than 10,000 executives, engineers and production men from the metal industry attended the meeting at which some 200 manufacturers displayed light metal working equipment.

The 3 societies cooperating with A.S.M. in the Congress were the Wire Association, the American Welding Society, and the Iron and Steel and Institute of Metals divisions of the Mining and Metallurgical Engineers.

"No New Facilities Policy" Reaffirmed by WPB

Washington—More severe War Production Board axe-wielding on new plant facilities — construction, equipment and machine tools—has become a definite governmental policy. Any question about that policy was answered in a recent statement by the agency.

Policy: "It shall be the continued policy of the War Production Board to restrict construction of new facilities and to reduce facilities under construction to the minimum necessary for the war program and for essential civilian needs, in order to conserve to the utmost all resources for the production of war supplies and equipment.

"In accomplishing this result, the Board will in each case seek a minimum consumption of materials and manpower, together with maximum utilization of existing facilities and equipment. The Directive for Wartime Construction dated May 20, 1942, which established these principles is hereby affirmed."

Membership of the Facilities Committee, established to carry out this policy, will consist of representatives of WPB, War Department, Navy Department, Maritime Commission, Army Air Forces, Navy Bureau of Aeronautics, and Office of Civilian Requirements.

Machine Tool Oil Usage Reduced With New Lubricant

Toledo—Development of an all-purpose lubricant for automatic screw machines by Willys-Overland Motors has saved 50,000 gallons of oil during the last three months, production engineers at the automobile concern have revealed.

Use of the so-called "triple-threat" lubricant also has reduced by 40 per cent the man hours previously expended in oil handling, according to Marvin J. Alef, manager of the concern's Toledo bullet core plant, although the output of the screw machine units in that period was stepped up 23 per cent.

All-Purpose: Devised by engineers of the Jeep builder in collaboration with

(Continued on page 129)

Beauty on the Production Front

Curtiss-Wright photo

Comely Nancy Giacobbi, former photographer's model, dons her welding equipment in a Curtiss-Wright plant.

"Women in industry" now is an old story, but Curtiss-Wright Corporation publicists have come up with a really new and eye-filling version. Nancy Giacobbi not only left a promising career as a famous fashion model, but relieved her brother in war work so he might join the armed forces.

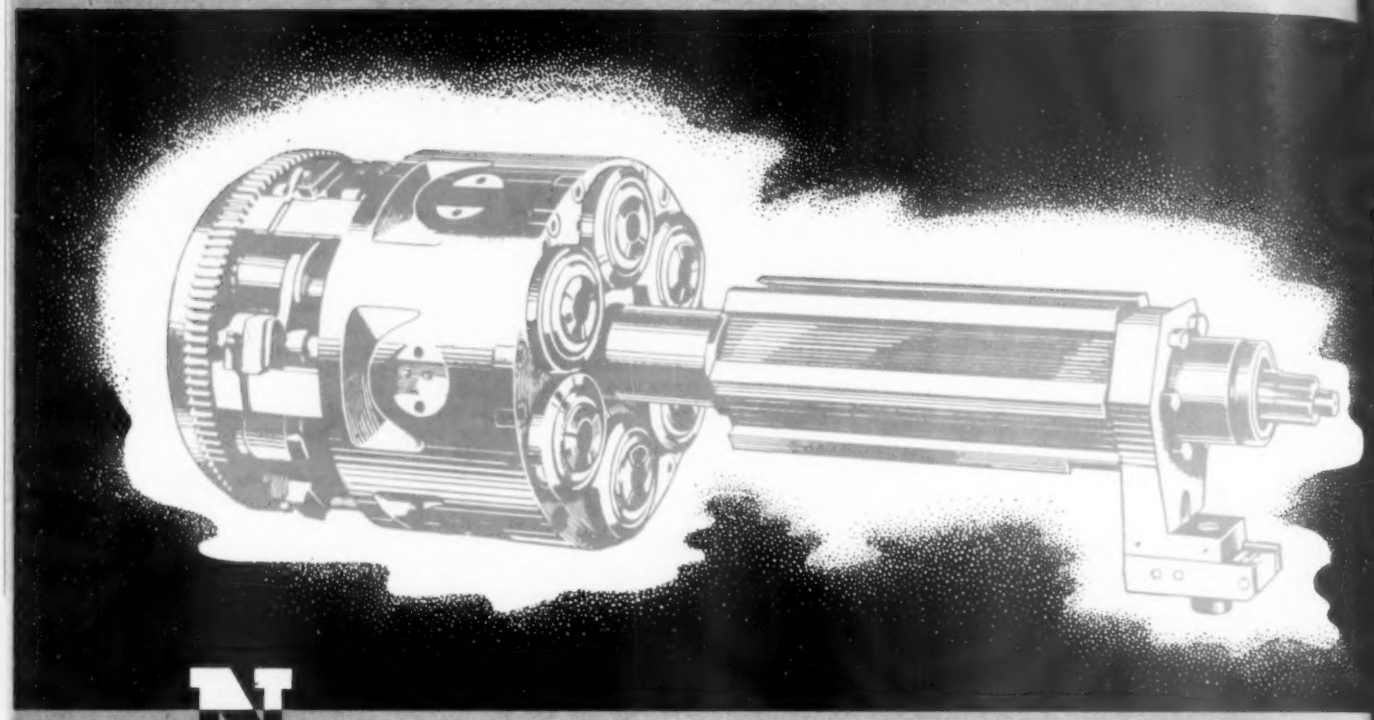
Nancy is shown here donning her welding equipment preparatory to work on hollow steel propellers in the Caldwell, New Jersey, plant of the Curtiss-Wright Corporation.

Production men not interested in the young lady or her fireproof costume might notice the welding jig on which her helmet rests.

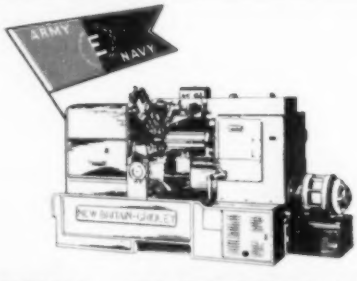
"GREENIE" T.M. REG. U.S. PAT. OFF. — ***The Metal Hoarder***

GOSH—LOOK AT THOSE TOOLS! HOW LONG HAVE YOU BEEN A MACHINIST?
I'M STARTIN' TODAY— I INHERITED THIS TOOL TRUNK FROM MY GRANDFATHER
IF HE KNEW HOW TO USE ALL THEM TOOLS, HE'D BE SMARTER THAN THE BOSS!
HE WON'T EVEN NEED AN OIL CAN TO RUN THAT MACHINE!
RALPH DAVIS

3 Exclusive Features for this 1 Assembly



NO wear, no weave, no uneven chucking pressure, thanks to three exclusive features of the Spindle Carrier assembly in a New Britain Machine Screw Machine. When you pick New Britains you get *continued* dependability, *continued* accuracy, *continued* speed, because of the features to be found *only* in New Britains.



NEW BRITAIN AUTOMATICS

GET MORE DONE IN WAR OR PEACE

NEW BRITAIN GRIDLEY-MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

BUY MORE WAR BONDS!

MAKE EVERY DOLLAR COUNT

(Continued from page 127)

leading chemists in the oil industry, the all-purpose liquid is said to replace three different types of oil—gear, cutting and concentrated—formerly needed to operate the screw machines.

Prior to the preparation of the oil, Alef explained, each of the company's machines was losing approximately 5 gallons of gear lubricant daily through leakage into the cutting tool coolant. The resultant mixture then required the addition of concentrated oil to render it useable for its cooling function.

Alef states that the division will show even greater oil savings in the present 3-month's period owing to the recent installation of additional screw machines for the .30 calibre bullet core production.

Cincinnati Milling Scene of Annual Meehanite Meeting

The Meehanite Research Institute of America, Incorporated, will hold its annual meeting of members at the plant of the Cincinnati Milling Machine Company, Cincinnati, Ohio, November 3 and 4.

Technical Data: At the meeting, important research data compiled by member foundries as a result of war production experiences will be presented and exchanged, the Institute has announced from its New Rochelle, New York, headquarters.

History Made in Radial Engine Mass Production

Aviation engine production history was made at East Hartford, Connecticut, late in September at the Pratt & Whitney Aircraft Division, United Aircraft Corporation, when the 100,000th "Wasp" engine was completed. The first air-cooled engine of this type was produced in 1925.

Historic: This engine established the basic air-cooled, radial design of the entire line of single and double row "Wasp" engines subsequently developed.

Wasp Engine Number 1, was built in Pratt & Whitney Aircraft's first shop in rented space in one end of a factory building used as a warehouse for tobacco storage in Hartford.

Truely a product of mass production techniques, the Double Wasp 100,000th engine was assembled in the huge plant in East Hartford of components machined there and in five satellite plants nearby. Each of these is many times larger than the original 1925 factory. Hundreds of subcontractors and vendors in more than 20 states of the Union each share a part of nearly 10,000 precision parts in the engine.

Riveting Takes Back Seat for Welding and Casting in Tanks

Toronto — Welding and casting are rapidly supplanting riveting in tank hull production in Great Britain, Canada and the United States because it is simpler and safer, L. E. Carr, Technical Director, British Ministry of Supply Mission, Washington, said at a joint meeting of the American Society of Mechanical Engineers and the Engineering Institute of Canada.

(Continued on page 130)

Of all the many different shapes of Swiss-Pattern files (there are more than 40 in the "American Swiss" line) the Pillar files are perhaps the most widely used.

To be sure of getting best results from the Pillar files you buy, insist on "American Swiss". These precision tools are made of the finest file steel (not tool steel) . . . uniformly hardened by special heat treatment. Their teeth are clean, sharp and accurately cut, and they have more filing surface than ordinary files. Users report that these precision tools, like other "American Swiss" Swiss-Pattern Files, save upwards of 30% of filing costs because they file faster and last longer.

So be sure to insist on "American Swiss" when you buy Pillar or other Swiss-Pattern files . . . obtainable from our Distributor . . . there's one near you.

FREE CATALOG SENT ON REQUEST

American Swiss File & Tool Co., Elizabeth, N. J.

ASK FOR THEM BY NAME

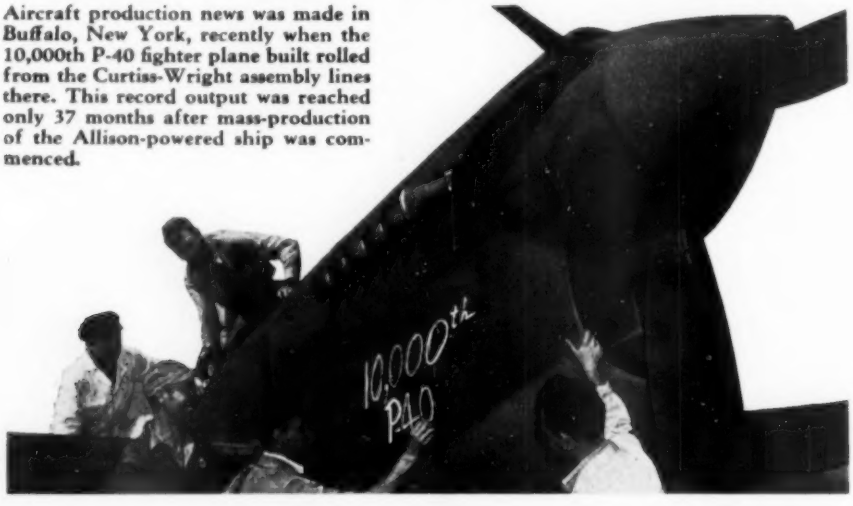
American Swiss

SWISS PATTERN FILES

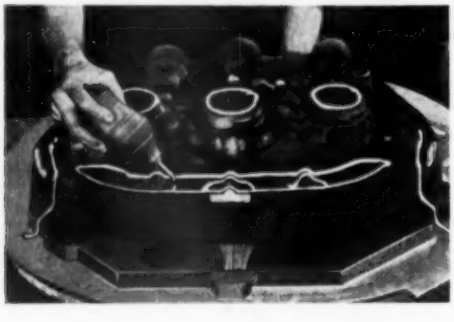
PRODUCTION PIX

WHAT'S DOING IN THE WORLD OF MASS MANUFACTURING

Aircraft production news was made in Buffalo, New York, recently when the 10,000th P-40 fighter plane built rolled from the Curtiss-Wright assembly lines there. This record output was reached only 37 months after mass-production of the Allison-powered ship was commenced.



Chatting at National Association of Foremen's Convention by Radio are, left to right: F. H. Irelan, new NAF president, Delco Products; B. A. Hodapp, new NAF vice president, Peerless Saw; Vincent Lopez, orchestra leader; Col. E. A. Deeds, chairman of board, C. Kindl, vice president, National Cash Register.



***Left*—At the new Chevrolet Motor foundry producing magnesium castings for aircraft engines, the interstices between cores are sealed with a paste mixture dispensed from a hand syringe to control the flow of the light metal.**

●

***Below*—"This ain't hay", and it's a good deal more valuable. Here are stainless steel turnings gathered by the Salvage Division at General Electric's Lynn River Works.**

(Continued from page 129)

Reasons: "The greatest disadvantage of riveted construction lies in the stripping of rivets on impact of the hull by a heavy projectile," Carr said. "The rivet flies apart when the blow is struck and fragments are projected into the hull. Many forms of rivets and rivet heads have been developed but this trouble is always present.

"In addition to this, it is almost impossible in practice to produce and maintain seams sufficiently tight to withstand the impact of even small arms bullets, since the latter disintegrate at the instant of striking, and fine particles of metal almost in the form of a vapour will penetrate the seams and cause damage.

"In order to overcome these disadvantages, a great deal of attention was paid before the war to welding, but the composition of the armor was generally such that satisfactory welding could not be achieved, and the alternatives of casting or welding underwent rapid development with the results that both methods can be applied satisfactorily," he explained.

"A marked feature of armored fighting vehicle construction in the United States is the amount of welding in addition to cast construction employed. The use of welding simplifies fabrication, eliminates much machining and reduces production labor. Welding is being extensively applied to scout and reconnaissance cars, and medium and light tanks," Carr continued. "Riveting involves drilling and preparation of plate by machining, all of which is obviated with cast construction and much is obviated with welded structure.

"To the American designer, the ease with which an article can be produced almost equals in importance the suitability of the product for its ultimate purpose. This has long been recognized as one of the most outstanding features in all fields of American engineering," the A.S.M.E. speaker said.

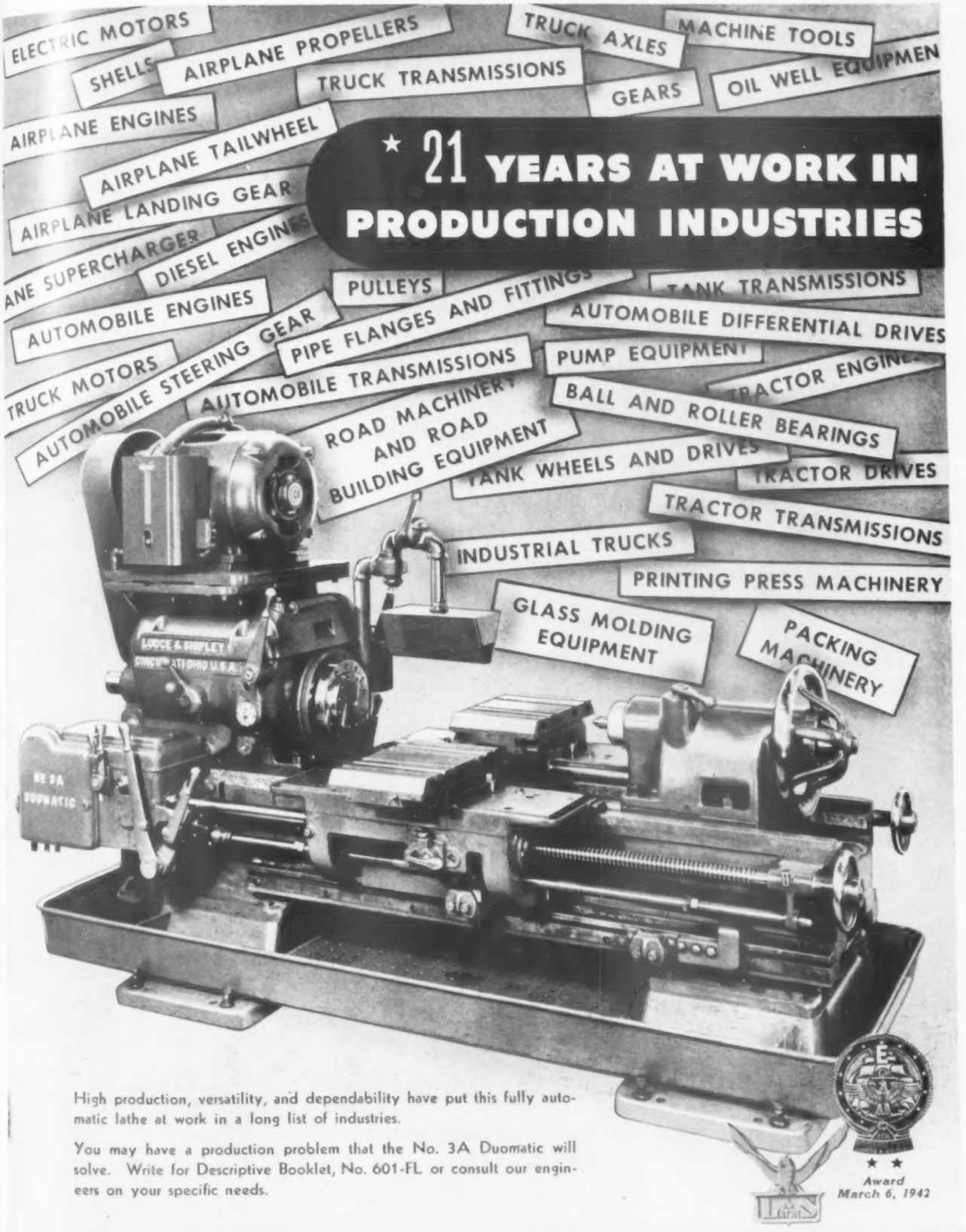
"Needled" Steels Protection Against Alloy Shortage

Milwaukee—How steels of the future may be improved in quality and how any threat of a shortage of such critical alloying elements as nickel, chromium and molybdenum can be safeguarded in the war effort, was described by R. B. Schenck, Chief metallurgist of the Buick Motor Division, speaking at the National Tractor Session of the Society of Automotive Engineers.

Discussing "special addition agent steels," or what are known in the metal working trade as "needled" steels, the auto concern's metallurgist declared that should our supply of the commonly used alloying agents be cut off or war demands exceed our limited supplies, steels of comparable characteristics fully suitable as to hardenability, tensile strengths, machinability and the like, can be produced by the use of certain ferro-alloys containing boron, known as "special addition agents."

In Use: Although boron was used as an alloying agent in steels as early as 1917, the additive treatment of steel from a commercial standpoint is relatively new, having started in 1938. At that time a specially treated heat of basic open hearth steel for the Buick Motor Division produced such unusual

(Continued on page 132)



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CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES

(Continued from page 130)

results, according to the metallurgist, that immediate steps were taken to verify them.

Since then, much experimental work has been done by Buick, other users and steel producers; new addition agents have been developed, and thousands of tons of special addition agent steels have been made and used for a great variety of applications.

The first commercial applications of these steels were made in the automotive industry. There are thousands of cars and trucks on the roads today with special addition agent steels in such vital parts as steering knuckles, steering arms, knuckle supports, transmission gears, transmission main shafts, differential gears and axle shafts. The performance of these parts has been entirely satisfactory, Schenck said.

A recent war production application of more than usual interest is a long torsion bar two inches in diameter, made of treated high alloy steel. This material was adopted after a number of other untreated steels were tried without success.

The nominal composition of currently available special addition agents consists of various combinations of such elements as aluminum, boron, calcium, manganese, silicon, titanium and zirconium. Other compositions have been used, several of which contain vanadium, but due to the critical[illegible]s of this element, the vanadium types [illegible]ave been ruled out for the duration.

No standard specifications now exist for special addition agents, Schenck said, pointing out that it now has become obvious that chemistry alone will not suffice. He said that hardenability and possibly mechanical properties will be required in addition to chemistry to formulate specifications. Tentative specifications, including chemistry, hardenability and merit index based on tensile strength and reduction of area, he said, are now receiving serious consideration.

Test data pertaining to treated steels has been collected and published in an American Iron and Steel Institute report, and another survey for additional data is being planned, Schenck said.

Business Notes from Industry: Purchases, expansions and new services

Color-Branding: Because the wide use of sintered carbide for cutting tools has introduced a confusing variety of grades of similar appearance, Firth-Sterling Steel Company has developed a system of color-branding for quick visual identification of its different grades of sintered carbide tools and tips.

The company says that users can identify the grade desired for a particular job quickly and accurately by matching the color found on the tip with the corresponding tint on a wall chart furnished upon request. The chart lists eight grades of sintered carbide made by Firth-Sterling.

After the tip is brazed to the tool, the color that appeared on the tip is painted on the shank for reference.

Agency: Frey Industrial Supply Company, Los Angeles, has been named Southern California representative for Taft-Peirce Manufacturing Company, Woonsocket, R. I., according to a Taft-Peirce announcement. The agency covers both gages and the extensive line of small tools made by the company.

Acquisition: Heller Brothers Company, Newark, N. J., has acquired the goodwill, trade name, and patents of the Cleveland File Company, Cleveland, according to Fred H. Stout, vice-president in charge of sales at Heller.

John E. Nicklis, formerly an executive of Cleveland File, has joined the Heller organization, which manufactures files, rasps, tools, and steel.

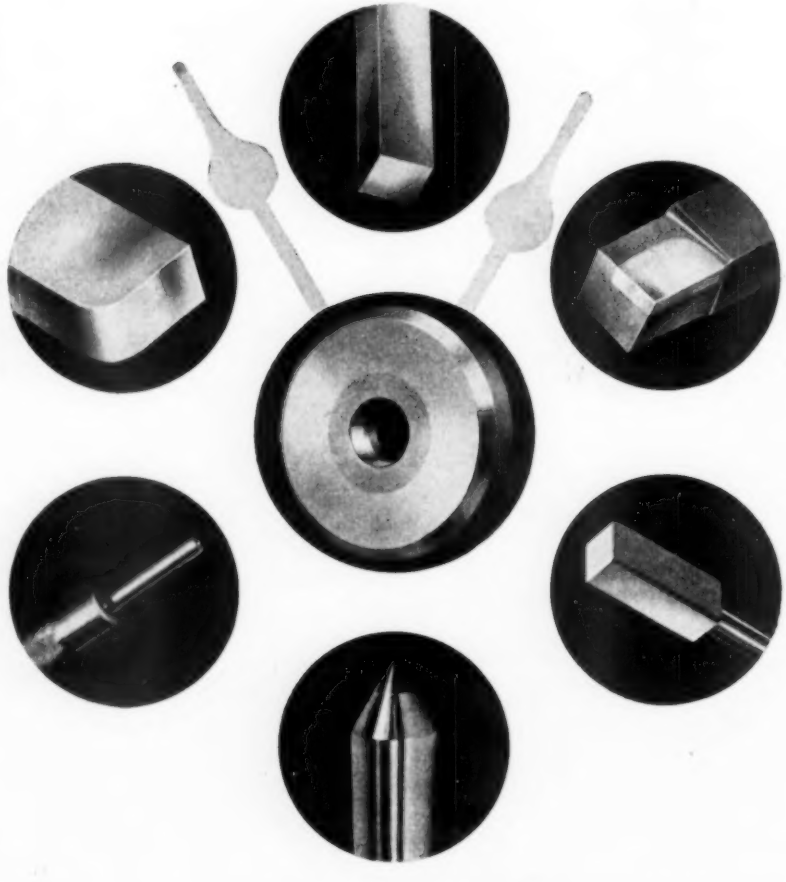
Tires: Goodyear Tire and Rubber Company reports that ground has been broken at Jackson, Michigan, for a new $320,000 plant to be equipped for manufacture of tires from synthetic rubber.

The expansion program, which is to cost approximately $400,000, is designed to convert all production facilities to manufacture of tires and tubes for cars and trucks. Manufacture of anti-tank cannon and bullet-proof gasoline tanks will be completed in a few weeks, after which new equipment for tire making will be installed in the entire plant, it has been reported.

Growth: The Cleveland Tool and Engineering Company announces that it has moved to new and larger quarters at 1251 West 4th Street, Cleveland. The new plant has improved facilities for the manufacture of circular relief grinders and universal indexing heads.

High Gear: Production of war goods at Westinghouse jumped to a record

(Continued on page 134)



WAR-PRODUCTION TOOLS

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Tools, dies, lathe centers, hones, gauges

Tamaloy carbide blanks.

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In tests of arms, explosive shocks make war on hollow screws. Giant stresses attack the holding-power of fastenings. Behind battle-fronts the machinery of production strains and batters away at restraining *threads.*

But for 30 years before this war, "ALLENS" met tests no less critical at the time. Each new demand for holding-power brought new Allen developments *in advance.* We proffer you now—Dependability *IN ADVANCE.*

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Order through your Industrial Distributor, to take advantage of his position as the *mass-purchasing agency* for your locality.

THE ALLEN MANUFACTURING COMPANY
HARTFORD, ★ ALLEN ★ CONNECTICUT, U.S.A.

INDUSTRIAL NEWS DIGEST

(Continued from page 132)

high in August for the third consecutive month despite government cancellations due to production changes according to the company.

Shipments for the month were in excess of $67,000,000, topping the July total by more than $12,000,000. Value of all shipments by Westinghouse plants since Pearl Harbor exceeds one billion dollars.

The company reports that cancellations of orders during the first eight months of 1943 totalled approximately $141,000,000. However, this was offset by new orders, so that the backlog of unfilled orders held by the company still is upward of $900,000,000.

Westinghouse and its war production activities hit the front pages throughout the nation during the past month when the Navy Department announced,

(Concluded on page 146)

C. E. Johansson: Gage Genius

Mass production, based on interchangeability of parts, owes much to one man, Carl Edward Johansson. In his death at the age of 79, at Eskilstuna, Sweden, the science of fine tolerance lost one of its most notable contributors.

Credited with the invention and development of the "world's standard of measurement", he moved from his native Sweden to America to lay the cornerstone of today's gage block industry.

"For accuracy and almost universal application," says the Encyclopedia Britannica, "the gage blocks made by C.E. Johansson... stand high. The first combination set on his system was made in 1897, but not until 1911 was Johansson able to produce them in commercial quantities of a guaranteed quality. Subsequently these blocks became so recognized as standard that there is hardly a manufacturing plant in the world doing accurate interchangeable metal work that has not one or more sets for reference purposes or actual use."

•

Johansson was president of C. E. Johansson Aktiebolag Engineering Works, Sweden, manufacturing blocks and other tools on a large scale. A plant which he founded at Poughkeepsie, New York, was acquired by Henry Ford in 1923.

Subsequently, he carried on his production and development work in measuring devices in the motor pioneer's laboratories at Dearborn, Michigan, developing principles in gage block manufacture which have been widely adopted.

•

Having contributed much to making automobile parts interchangeable, he was well known in the automotive industry. Members of the Swedish Engineers Society, Detroit, with which Johansson was associated, credit Henry R. Leland with first recognizing Johansson's genius.

In 1907, Johansson met the early auto builder, saying he was happy to know the man who pioneered interchangeability in automobile manufacture. Shaking the gage maker's hand, Leland replied, "I am honored to meet the man who made that interchangeability possible."

Courtesy Norris Stamping and Manufacturing Co., Los Angeles, Calif.

SOFTENING A HARD PRODUCTION PROBLEM

SEVERAL of the toughest problems in converting cartridge cases from brass to steel have been solved by TOCCO. For example:

Forming the mouth of 3″ case by cold-drawing causes work-hardening. This area should be ductile, to permit crimping to the projectile and to assure a gas-tight seal in the gun on firing. On the other hand, the side wall up to the mouth should be hard and "springy" to withstand the high firing pressures and still permit easy extraction of the case after firing. The hard-to-soft transition zone should be accurate.

The answer was found by annealing the cartridge case mouth. TOCCO Induction Heating applies a uniform amount of heat for an exact length of time to a definite, prescribed area of the case . . . softens the mouth without affecting the side wall . . . assures accurate results on every single piece at a high production rate.

Material treated is SAE 1030 spherodized steel. Heated to 1300° F. Heating time per shell 4 seconds. Hardness before, 98 R.B.; after, 70 R.B. Output per machine (2 stations), 1000 cases per hour. TOCCO machine is clean and compact; doesn't require skilled labor.

Find out how TOCCO can help solve *your* annealing problems . . . your hardening, brazing and heating problems, too . . . present and post-war.

THE OHIO CRANKSHAFT COMPANY, *Cleveland, Ohio*

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HARDENING . . BRAZING
ANNEALING . . HEATING

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CUTTING TOOLS ARE *weapons*

The ability of cutting tools to produce to their maximum is as important on your production line as are weapons of death on the firing line.

Good cutting tools, properly sharpened and ground, should be as efficient throughout their life as they were when originally received from the manufacturer.

Illustrated here are simple instructions for sharpening and salvaging standard Counterbores. No particular trick or wizardry is required. Simply follow directions.

Reprints on request for posting in your Grinding Department

LAND or Primary Clearance – Be sure to maintain the 7-degree clearance angle indicated . . . this relieves and supports the cutting edge. Width of Land should be 1/32" on small, 1/16" on medium and 1/8" on large cutters. When width of Land is increased by sharpening, the Heel or Secondary Clearance should be reground.

HEEL or Secondary Clearance – For accurate and free cutting action, it is important to maintain the Heel or Secondary Clearance at the 29-degree angle indicated. This provides proper chip clearance (eliminates clogging) in the flute – reduces the material to be removed when grinding Land or Primary Clearance.

For best results use a soft, medium grade emery wheel – 48 to 60 grain. Free hand grinding is not recommended. When excessive sharpening is necessary, keep the cutter **cool.**

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Manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools

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Rigidly controlled in manufacture, TECO Cemented Carbide is harder, denser, more uniform in structure—therefore more resistant to wear and breakage in high-speed turning, boring and facing of the toughest metals.

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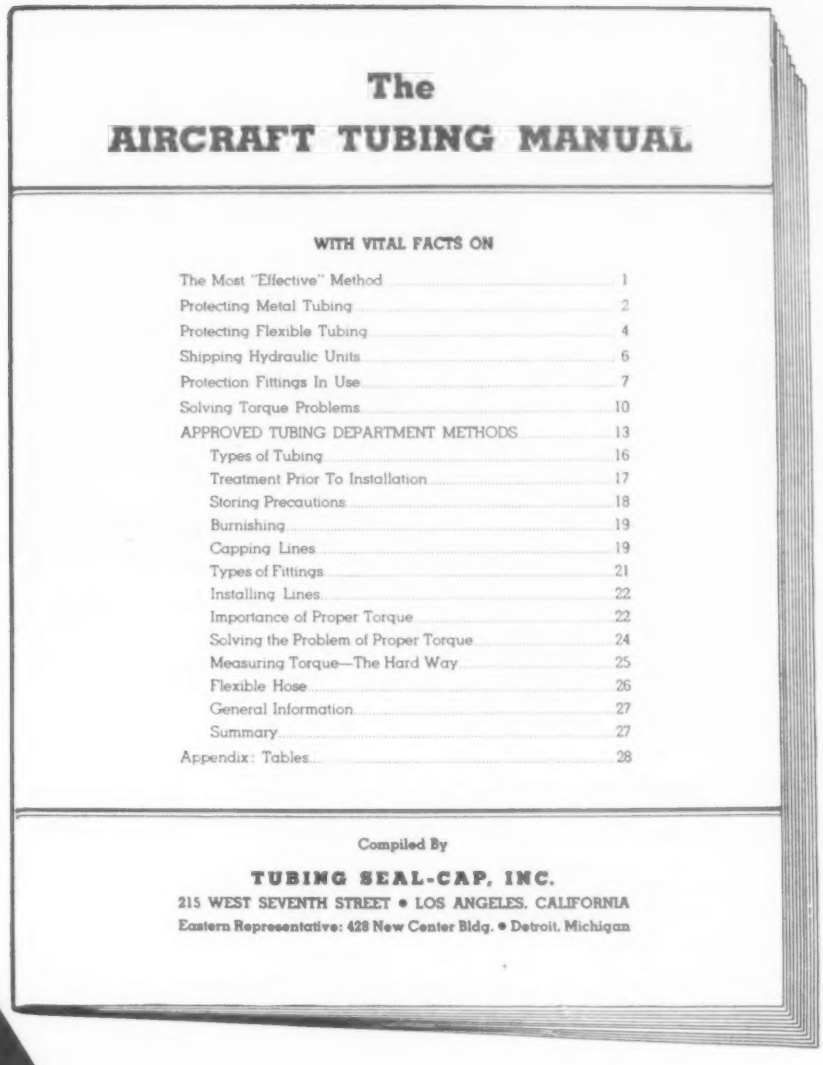
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Shipping Hydraulic Units 6
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Solving Torque Problems 10
APPROVED TUBING DEPARTMENT METHODS 13
Types of Tubing 16
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Storing Precautions 18
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Types of Fittings 21
Installing Lines 22
Importance of Proper Torque 22
Solving the Problem of Proper Torque 24
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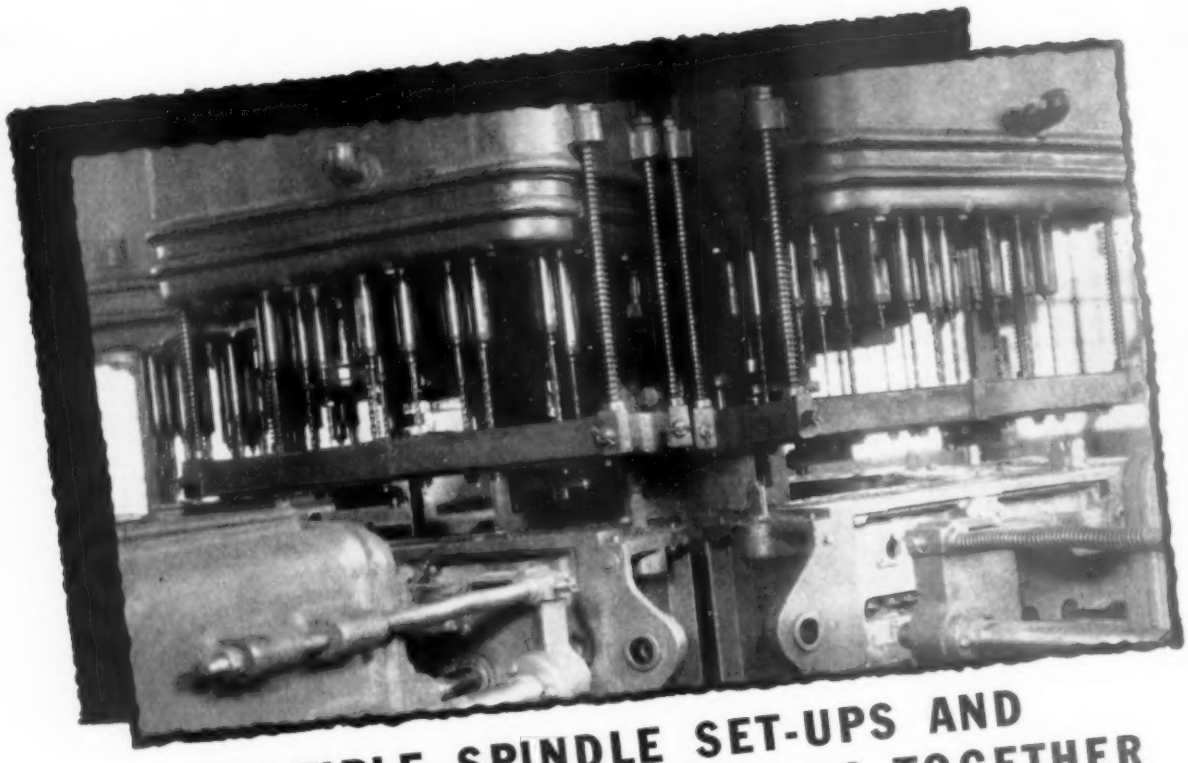
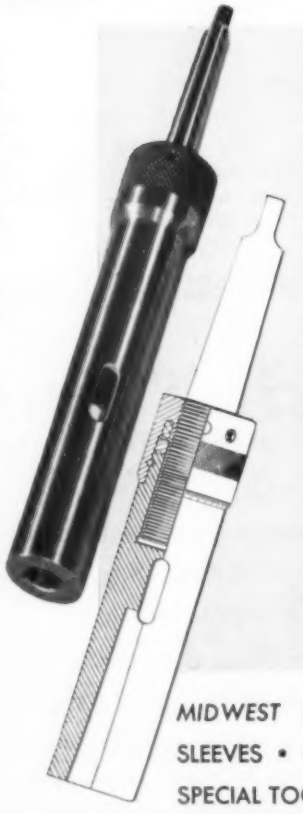


MULTIPLE SPINDLE SET-UPS AND HEADACHES OFTEN GO TOGETHER

Misaligned tools, excessive set-up time, inexperienced help and complicated adjusting mechanisms on tool holders or holders that do not provide accurate micrometer adjustments—these are some of the headaches which often accompany multiple spindle set-ups. They are obstacles to securing accurate work and maximum production.

Midwest Adjustable Extension Tool Holders were designed for multiple spindle production jobs. They provide a simple to operate, yet a micrometer accurate adjustment to compensate for unequal tool wear and for variations in tool length. The adjustable feature reduces set-up time and makes the axial position of all the tools on the job accurate. With these holders it is possible to drill, tap, counterbore or ream to various depths or use tools of unequal lengths.

- ADJUSTMENTS CAN BE MADE IN STEPS OF .001 OF AN INCH.
- OPERATOR CAN MAKE ADJUSTMENTS BY HAND —NO TOOLS NEEDED.
- SET-UP TIME IS REDUCED.
- DESIGN IS SIMPLE, CONSTRUCTION RUGGED, ALIGNMENT ACCURATE.



HERE'S HOW THEY WORK

Midwest holders are provided with an extremely accurate, ground fit between the sleeve and the shank. A knurled, graduated collar which controls the adjustment is located at the top of the sleeve. A key fixed in the sleeve with a sliding fit to a keyway in the shank provide a positive drive.

Micrometer, longitudinal adjustment steps of .001 of an inch are made by turning the collar one space on the bevelled edge, graduated scale. The collar holds firmly at all positions of the scale. There are no screws or locknuts to give trouble and, without tools of any kind, the operator can easily make the adjustment by hand.

MIDWEST PRODUCTS INCLUDE—MILLING CUTTERS • SLEEVES • COUNTERBORES • END MILLS • REAMERS • SPECIAL TOOLS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS.

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Industrial Distributors and Factory Representatives in all production centers of the United States

MIDWEST

OVER 600 ATTEND A. S. T. E. SEMI-ANNUAL CONVENTION

(Continued from page 116)

to $1,000. Using induction heating equipment, costing $15,000, he said, this unit cost was reduced to 30 cents. The production remained at 800 pieces per day, with a consequent saving of $800 per day.

"The second example cited by the Ohio Crankshaft representative and one, he said, that is enjoying increasingly wide application, is the heat treating of small runs of bar stock. In treating a uniform length of bar by induction method in the shop using the stock, he said, a savings of $15. a ton under the mill price for such heat treating is being made. The product he pointed out, is more uniform by the induction method than by furnace treating at the mill.

The doubled mill price, he said, was entirely justifiable. Though the mills can supply satisfactorily normalized stock, they haven't the furnace capacity now to turn out small orders. A post-war development, he predicted, would be the utilization by the mills of the induction method to cut costs to the customer and produce a superior product.

MATERIALS HANDLING STUDIED

A. E. Rylander, Technical Editor of The Tool Engineer magazine, was chairman of the session on "Materials Handling and Plant Layout". Repeated references were made by the session speakers to Rylander's recent series of articles on plant layout in this magazine.

"Materials Handling and Engineering" was the title of an illustrated talk by Randolph W. Mallick, Section Engineer, Headquarters Manufacturing Engineering Department, Westinghouse Electric and Manufacturing Company.

Plant layout and materials handling, Mallick predicted, "will be of keen interest for the next decade.

"Plant layout is an industrial fundamental. Materials handling is a multi-billion dollar business. Industry can no longer afford to neglect these two fields which to a large extent, will determine the efficiency, the profit-making ability, and in some instances, the survival of an enterprise.

PLANT LAYOUT IS NEW SUBJECT

"Because plant layouts are not obvious to the average individual, is all the more reason why they must be planned by persons specializing in this field. Experience often shows that no factor in the industrial engineering field causes greater losses and still remains undetected than does the improper physical layout of the plant. It is the one factor that customarily receives the least attention for the simple reason that relatively few people are qualified to evaluate properly, the effectiveness of manufacturing layouts.

"Much of our thinking as related to plant layout dates back to the days of line shafting and group driven machines, days before conveyors and suspended cranes, tiering machines, and portable bins and many other features not available even five years ago. A striking example of this form of thinking is illustrated in the location of many of our factory aisles. You have undoubtedly visited buildings which were bisected by an aisle running directly through the middle of the building. This usually results in two long narrow work areas with the material in process moving back and forth across the aisle throughout the work sequence.

"Such an aisle arrangement dates back to the days when line shafting, usually suspended from columns, necessitated locating the machine tools in such a fashion. Precedent motivates us to continue such schemes.

"It can conservatively be said that the efficiency which any plant can ultimately obtain can be no higher than the limitations of its layout. The distance traveled by parts in the course of their manufacture, the manhandling of materials, the ineffective effort of production operators, the proper sequency of processes, the efficient storage of materials, and many other elements, all affecting the manufacturing cycle, time, and cost, are influenced by the layout of the plant.

SELF-POWER HANDLING EQUIPMENT

"We are putting forth great efforts to improve our designs, methods, tooling and processes and commendable progress has been and is being made in these fields. We concentrate our efforts here because these problems surround us daily and are apparent. Plant layouts are too vast to be easily comprehended in proportion to problems we can see without the necessity of mental visualization," Mallick said.

At the same session, Ezra W. Clark, vice president and general manager Clark Trucktractor Division, Clark Equipment Company, talked. Introduced as "the grandfather of self-power materials handling equipment", Clark pointed out that the internal freight bill in American plants exceeds the external freight bill involved in mass manufacturing operations.

COST OF MATERIALS HANDLING

"It cost more to move a ton of steel in fabricating in an automobile plant," he said, "than it did to move the ton of steel from Pittsburgh to Detroit."

In describing "Mobile Materials Handling Equipment", the speaker said he believed that as a result of the use of the fork truck a far greater percentage of skilled labor will be used in post-war auto production than when motor manufacturing ceased in 1942.

W. V. Casgrain, president, Conveyor Association, and president of Mechanical Handling Systems, Incorporated, with L. J. Bishop, vice president and chief engineer of the same organization, closed the session with provocative and informative observations on the use of conveyors in production.

Casgrain, whose company has engineered conveyor systems in many of the largest automobile and aircraft plants, credited Henry Ford with pioneering the conveyorized assembly line. The

(Concluded on following page)

Canadian gift

Walter Sargent, Lakehead Chapter, Port Arthur and Fort William, presents A. S. T. E. President Morris with meeting bell made by the Canadian chapter members for use at executive meetings.

Bramson Staff photos

Technical speakers revealed new production techniques

Left to right: **G. B. Berlien, Lindberg Steel Treating Company; R. L. Fitzsimmons, E. C. Atkins Company; and Dr. H. B. Osborn, Jr., Tocco Division, The Ohio Crankshaft Company, were participants in the "New Heat Treat Techniques" session.**

(Concluded from preceding page)

motor magnate, he said, first applied the conveyor to final assembly in Detroit in 1912.

"Curiously enough," Casgrain pointed out, "Mr. Ford applied the conveyor to the last operation—final assembly—whereas, today, our thinking in the use of conveyors is just the opposite. We try to conveyorize the first, or basic operations." Casgrain explained that Ford first used the conveyor on final assembly because that was the chief bottleneck in auto building at the time, and the chief use of conveyors is to break production bottlenecks.

One of the high points of the technical sessions was reached when Andrew J. Langhammer, president, Amplex Division, Chrysler Corporation, described work his organization is doing in the field of powder metallurgy.

Pointing out that this technique is still in its infancy as far as application to machine parts is concerned, Langhammer said, "The art of powder metallurgy is not a panacea." He revealed that Chrysler has some 5,000 war jobs which involve the production of powder metallurgy of several hundred items in both ferrous and nonferrous metals, such as gears, ratchets, levers, cams, and hubs with internal and external splines.

In a session on "Tooling for the Inexperienced Operator", John C. Cotner, president, Logansport Machine, Incorporated, discussed the application of pneumatic and hydraulic devices to tools and machines.

Controls of this type, he said, are finding wide application in the metal cutting industry, especially among aircraft builders. One of the recent developments in this field, Cotner pointed out, is an air gage for rapid checking. Previously described in The Tool Engineer magazine, this gage permits accurate checking without handling the part.

CONVERSION OF MACHINES

L. R. Twyman, manager, Machinery Products division, Vickers Incorporated, predicted that the coming transition to peace-time production will undoubtedly be notable for a large-scale conversion of standard machines to single purpose machinery through the use of special fixtures.

This will be a big job for tool engineers, but, in Twyman's words, "juggling standardized machines merely requires fundamental knowledge, and can be done expertly after only a few weeks' experience."

With the use of hydraulic power, he said, such tooling functions as indexing, chucking and transferring may be easily accomplished. Such action, he pointed out, can be synchronized with machine tool feed.

A 16-INCH
GIANT
Small but mighty! Designed to assure operators of small machines the same dependable coolant flow that users of the regular sized Pioneer Pumps experience.
This new Model MVA is a seal-less, submerged type of pump for use either in coolant sump in base of machine or in separate tank. Chips or dirt that will pass through the grille at bottom of pump will readily pass through pump without injuring it.
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PIONEER Pumps
HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE
BUY
WAR
BONDS

RYLANDER REPORTS:

(Continued from page 113)

future use).

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COFFEE AND THEFT

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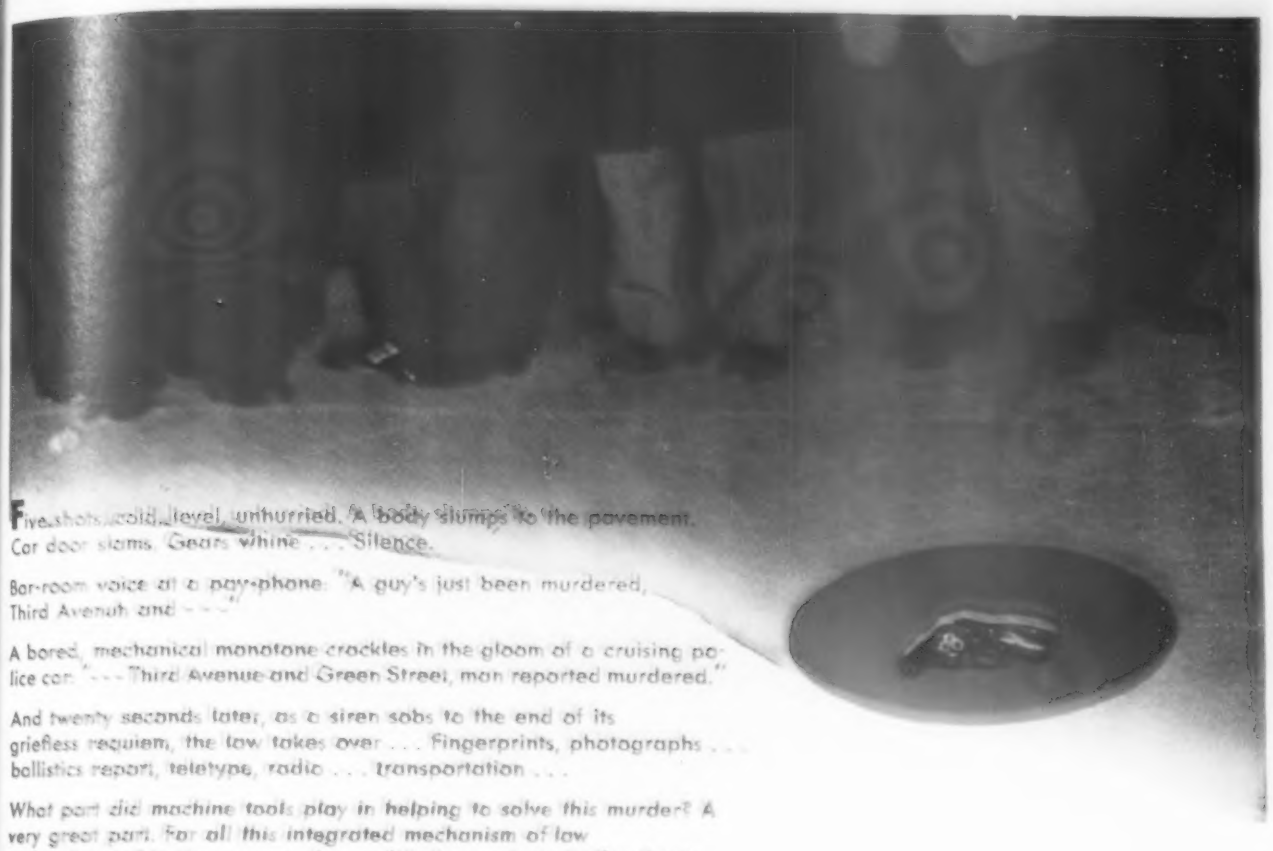
Anyway, coming back to the drink:

(Concluded on page 144)



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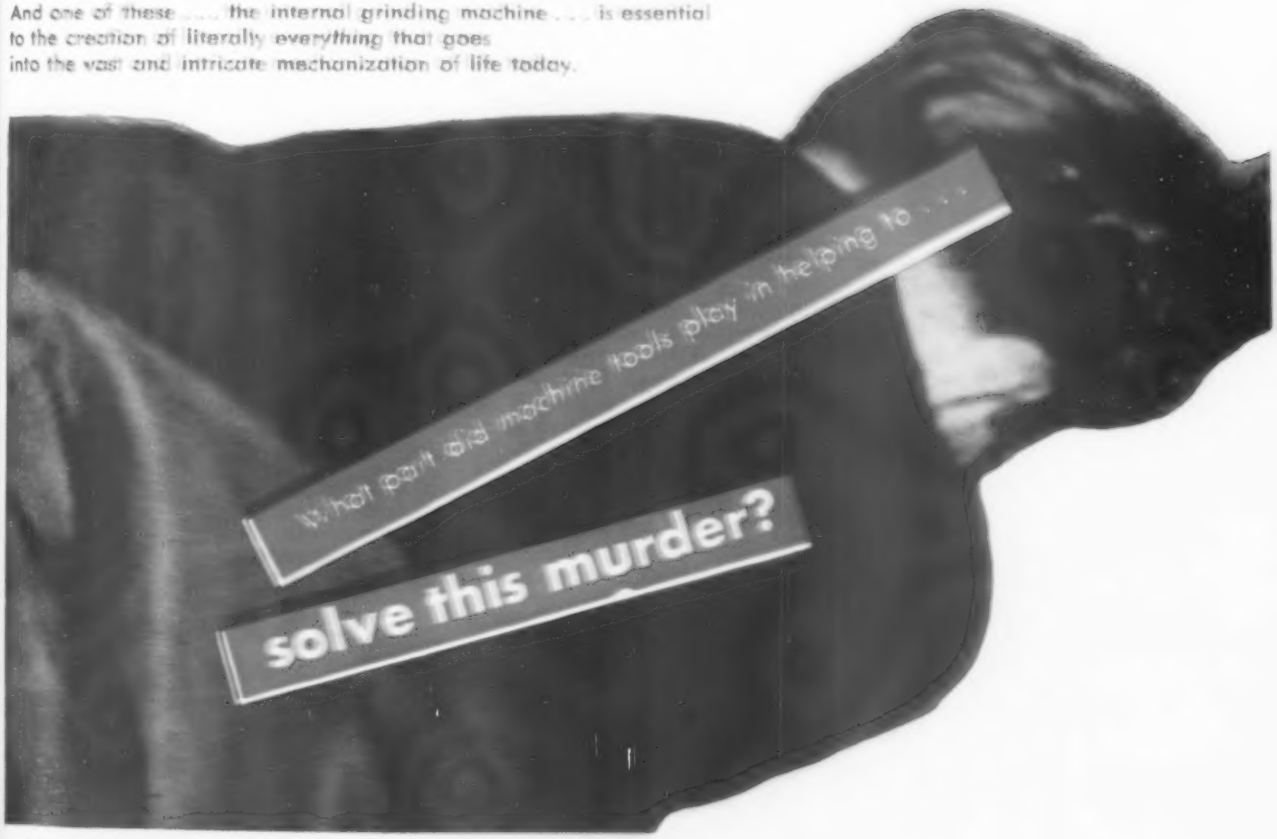
And twenty seconds later, as a siren sobs to the end of its griefless requiem, the law takes over . . . Fingerprints, photographs . . . ballistics report, teletype, radio . . . transportation . . .

What part did machine tools play in helping to solve this murder? A very great part. For all this integrated mechanism of law and order and justice was made possible by a relatively few basic precision machine tools.

And one of these . . . the internal grinding machine . . . is essential to the creation of literally *everything* that goes into the vast and intricate mechanization of life today.



BRYANT

BRYANT CHUCKING GRINDER CO. SPRINGFIELD VERMONT, U.S.A.

(Concluded from preceding page)
motor magnate, he said, first applied the conveyor to final assembly in Detroit in 1912.

"Curiously enough," Casgrain pointed out, "Mr. Ford applied the conveyor to the last operation—final assembly—whereas, today, our thinking in the use of conveyors is just the opposite. We try to conveyorize the first, or basic operations." Casgrain explained that Ford first used the conveyor on final assembly because that was the chief bottleneck in auto building at the time, and the chief use of conveyors is to break production bottlenecks.

One of the high points of the technical sessions was reached when Andrew J. Langhammer, president, Amplex Division, Chrysler Corporation, described work his organization is doing in the field of powder metallurgy.

Pointing out that this technique is still in its infancy as far as application to machine parts is concerned, Langhammer said, "The art of powder metallurgy is not a panacea." He revealed that Chrysler has some 5,000 war jobs which involve the production of powder metallurgy of several hundred items in both ferrous and nonferrous metals, such as gears, ratchets, levers, cams, and hubs with internal and external splines.

In a session on "Tooling for the Inexperienced Operator", John C. Cotner, president, Logansport Machine, Incorporated, discussed the application of pneumatic and airdraulic devices to tools and machines.

Controls of this type, he said, are finding wide application in the metal cutting industry, especially among aircraft builders. One of the new developments in this field, Cotner pointed out, is an air gage for rapid checking. Previously described in The Tool Engineer magazine, this gage permits accurate checking without handling of the part.

CONVERSION OF MACHINES

L. R. Twyman, manager, Machinery Products division, Vickers, Incorporated, predicted that the coming transition to peace-time production will undoubtedly be notable for a large-scale conversion of standard machines to single purpose machinery through the use of special fixtures.

This will be a big job for tool engineers, but, in Twyman's words, "juggling standardized machines merely requires fundamental knowledge, and can be done expertly after only a few weeks' experience."

With the use of hydraulic power, he said, such tooling functions as indexing, chucking and transferring may be easily accomplished. Such action, he pointed out, can be synchronized with machine tool feed.

A 16-INCH
GIANT
Small but mighty! Designed to assure operators of small machines the same dependable coolant flow that users of the regular sized Pioneer Pumps experience.
This new Model MVA is a seal-less, submerged type of pump for use either in coolant sump in base of machine or in separate tank. Chips or dirt that will pass through the grille at bottom of pump will readily pass through pump without injuring it.
Send for complete details
PIONEER PUMP & MFG. CO.
19645 JOHN R STREET
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PIONEER Pumps
HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE
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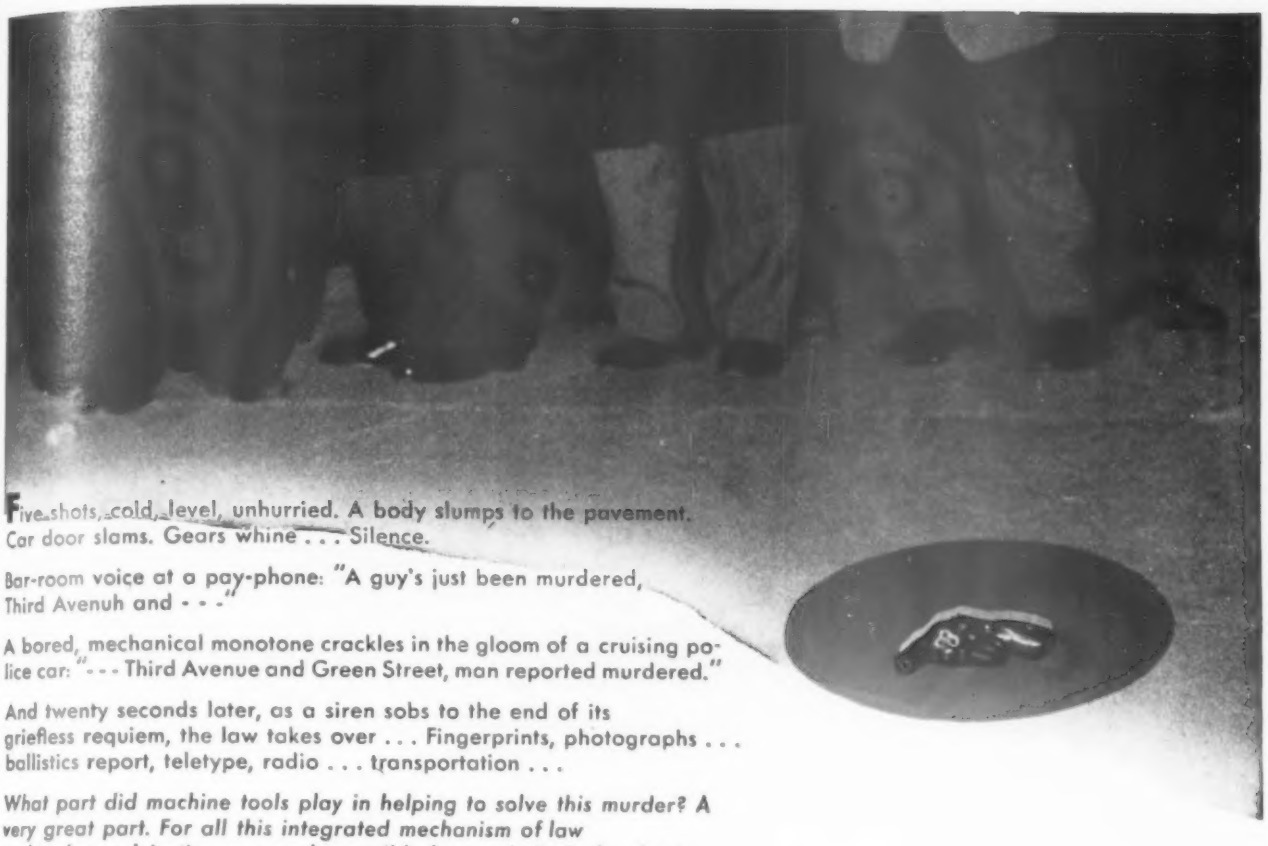

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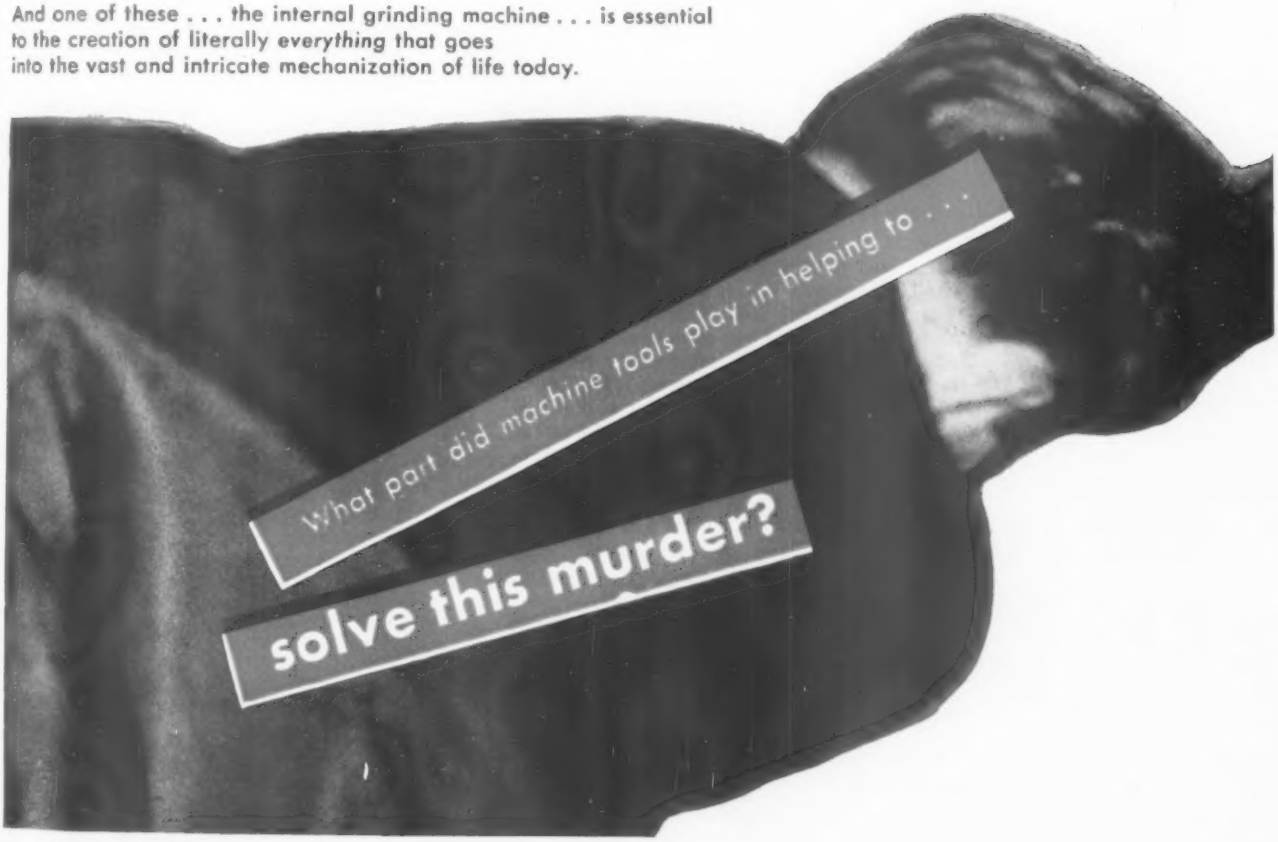


BRYANT

BRYANT CHUCKING GRINDER CO. SPRINGFIELD VERMONT, U.S.A.

W-S Standard Lathe Centers with carbide tips. Morse, Brown & Sharpe and Jarno tapers for both TURNING and GRINDING.
Tools of Weapons
TREAT 'EM RIGHT!
STANDARD
CEMENTED CARBIDE TIPPED
CENTERS

SAVE ON SET-UP, ADJUSTING and GRINDING TIME with these more *accurate* W-S Lathe Centers. Their concentricity is *guaranteed* to within .0002" or less! Made by entirely different method of manufacturing, W-S Centers help assure the highest degree of precision work from your machine tools. Genuine CARBOLOY tips (other carbides may be specified) reduce friction and give a cooler, more perfect bearing. The craftsmanship inherent with all W-S Centers goes far beyond the point of visual inspection. However, it is evidenced in their ability to maintain greater accuracy while outlasting from 10 to 60 ordinary centers. Carbide tipped tools are not just a specialty with us . . . we make them *exclusively*. The majority of sizes is available from stock most of the time. Write for FREE Catalog 942-A and latest prices. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI.

W-S Carbide Tipped Core Drills available in straight and tapered shanks. Sizes: 1/2 to 1-1/2.

W-S Standard Reamers with Carbide Tips. Tapered and straight shanks. Sizes: 1/4 to 1-1/2.

WENDT WS SONIS

CARBOLOY CUTTING TOOLS

CENTERS • DRILLS • CORE DRILLS • COUNTERBORES • SPOT FACERS
END MILLS • REAMERS • HOLLOW MILLS • LATHE BITS • SPECIAL TOOLS

(Concluded from page 142)

"Say when," sez Ray, pour[ing]. Then when the brimming cup [was] full. "How'd you know it was 'when' when you weren't looking at the glass, but at me?" "When you stopped smiling", sez Denham.

Can't begin to put down names of all I met, besides which (as usual) I can't read my notes. Dunno why I bother writing 'em, except that it makes a sort of impression, like. But was glad to see Bill Young, of Boston, the more so since he assured me that I'm still welcome in the Bay State after my appearance there last fall. That's friendship!

Was looking high'n low for one C. G. Kincaid of Montreal, a/c having an invitation to speak in The Wilderness come Nov. 10th. But that Canuck was as elusive as the proverbial needle in the haystack. Oh well, I'll meet him eventually—in his home town.

MORE CONVENTIONEERS

Gardner Young was the only Hound present except myself—and my bark's worse than my bite now that I've started cutting my third set o' teeth. Come to think of it, I forgot to pack my hair brush, but that presented no problem. Had lunch with Hank Faith, of Fond du Lac (he's the guy who took the Cup from Louisville), who invited me for a swim in Lake Winnebago. (Hope he meant next summer). A likeable guy, and I think he'll wear well on a fishing trip.

Barbecued with Frank Curtis, and saw Len Singer and Ted Barker heading for a movie as a late diversion. Me, I had decided to realize a lifelong ambition and get mildly illuminated, but got into a serious discussion and forgot all about it. Always that way!

Met serious and likeable Cliff Ives, and Paul Zerkle, whom I haven't seen since he joined Michigan Tool. Roy Bramson breezed in with associate editors Jerry Wilford, Wally Scotten and Ralph Davis, the latter T/E staff artist. Wally takes the pics and Ralph dresses 'em up.

All told, it was a fine convention —outstanding, considering the times. Travel is difficult and accommodations at a premium, but somehow, everybody was served. (Me, I even doubled for the hat check boy).

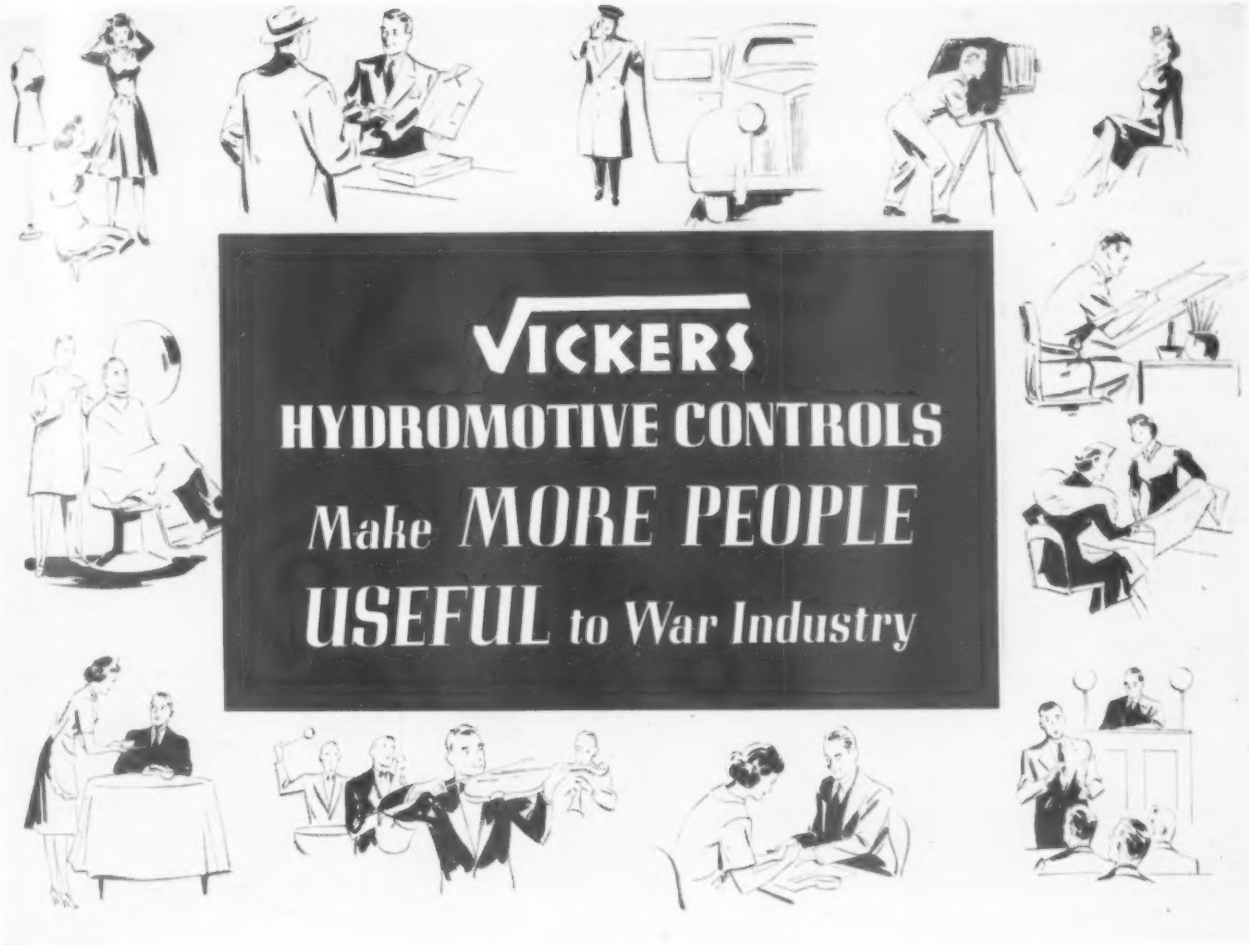
SEE YOU IN PHILLY

The Indianapolis men who served on the Committee of Arrangements deserve a big hand for a swell job, and Ade Potter and his staff from H. Q. worked like Trojans. Doug Burnside and Clete Briner are especially to be commended, both being about everywhere at once and, somehow, always at the right time.

Doug has shown outstanding qualities of leadership, is a fine executive and, like Clete, bears out my contention that if we carefully choose our vice presidents we'll have outstanding leaders when their turn comes to take the helm of the A.S.T.E. ship.

Now last, but not least, a good word for the boys from Purdue University, who helped out a lot at the Convention. Ken Duvall, especially, was of inestimable help with his movie and slide projector. Thanks, Ken! —and tell Prexy I said to give you all "A plusses" on your report card. And that's all for now; see you in Philly next March.

THE END



VICKERS HYDROMOTIVE CONTROLS Make *MORE PEOPLE USEFUL* to War Industry

Lawyers — manicurists — barbers — waiters — salesmen — housewives — all sorts of people must be used by industry to meet the critical manpower shortage. These people are usually entirely unfamiliar with machines and shops. Before they are useful in production, their sense of strangeness and their lack of self confidence must be overcome . . . and they must be taught to run a machine.

A complex machine makes the training task extremely difficult. It is much easier with machines equipped with Vickers Hydromotive Controls.

When one of these people is shown a Vickers controlled machine — shown how simple the controls are — how easy it is to produce good work, his strangeness and lack of self confidence are quickly overcome. It becomes much easier to train him to useful production needs.

With Vickers Hydromotive Controls, most of the required skill can be built into the machine. Complex operations can be reduced to simple routines or made automatic. Controls can be interlocked so it is impossible to do the job wrong. Exact load limitations are easily applied.

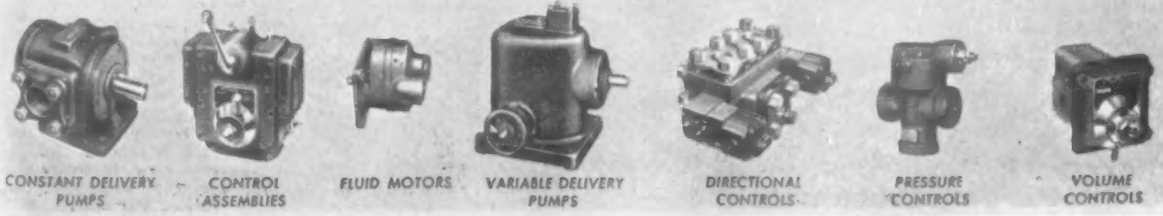
Discuss "hydraulics" for your machines with a Vickers Application Engineer.

VICKERS *Incorporated* • **1400 OAKMAN BLVD.** • **DETROIT 32, MICHIGAN**

Application Engineering Offices:

CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • NEWARK • PHILADELPHIA • ROCKFORD • TULSA • WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



CONSTANT DELIVERY PUMPS · CONTROL ASSEMBLIES · FLUID MOTORS · VARIABLE DELIVERY PUMPS · DIRECTIONAL CONTROLS · PRESSURE CONTROLS · VOLUME CONTROLS

Help Increase Production use the

SWEDISH INTERNAL INDICATOR GAGE

Write for Literature

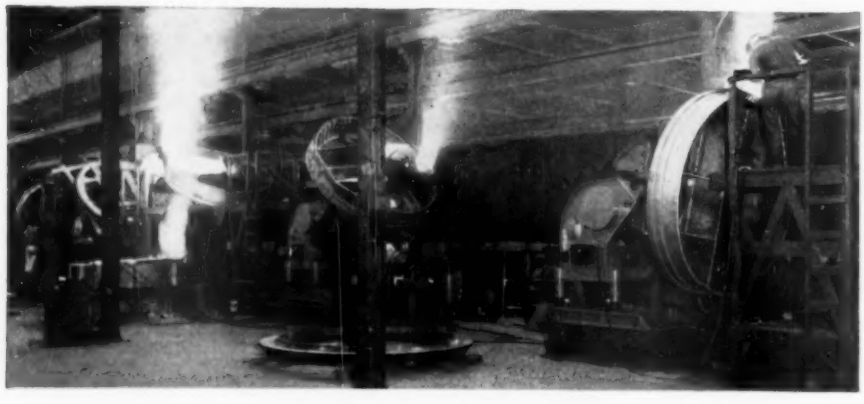
This light, easily handled instrument when used by machine operators, or on final inspection, serves to increase production, reduce scrap and assure a more uniform product. It is a reliable, precision indicator designed for rapid, convenient and accurate measurement of internal diameters. The scale range is: Plus or minus 0.001" graduated to 0.0001" and minus 0.020" graduated to 0.0001".

•

It can be set to any required size direct from Johansson Gage blocks or master ring.

Light—
Easily
Handled—
Flexible—

SWEDISH GAGE CO., OF AMERICA
8900 ALPINE AVE., DETROIT 4, MICH.



WELDING PRODUCTION GOES UP WHEN RANSOME POSITIONERS GO IN . . .

This statement is no empty claim. It is the summing up of results obtained by plants in every field of metal fabrication.

For Ransome Positioners really put welders and equipment to work at their top effectiveness. There's no waiting for crane service, no waste of priceless human energy. Each welder shifts his work independently and without effort. With a downhand position for every weld, larger rods can be used, which greatly reduces the cost per pound of deposited metal.

And welding *quality* goes up too. Here again, the downhand position pays off in stronger, cleaner, and more uniform welds.

To get the whole story . . . *write for new Bulletin*

RANSOME MACHINERY COMPANY
Ransome WELDING POSITIONERS

INDUSTRIAL NEWS DIGEST

(Concluded from page 134)

without explanation, that the East Pittsburgh concern was taking over the management of the $60,000,000 Naval Arsenal, Detroit, late in October.

Built and operated for the Navy by the Hudson Motor Car Company, the big plant in the Motor City was believed to have established an enviable record in the production of such firepower as Navy anti-aircraft guns.

The Detroit operation is the third Navy war production project which Westinghouse is managing; and it was hinted among government officials that the change in management was made to coordinate such work.

THE END

ARMY - NAVY "E" AWARD WINNERS

THE AMERICAN STEEL PACKAGE COMPANY
Defiance, Ohio

AMPEREX ELECTRONICS PRODUCTS
Brooklyn, New York

ASSOCIATED FOUNDRIES & MANUFACTURERS, INC.
New York, N. Y.

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE CO.
Elyria, Ohio

THE DAVID BELL COMPANY, INC.
Buffalo, New York

BIRD & COMPANY
Waltham, Massachusetts

CHAMPION SPARK PLUG COMPANY
Toledo, Ohio

CUSHMAN MOTOR WORKS
Lincoln, Nebraska

ELECTRO-MOTIVE MANUFACTURING CO.
Williamatic, Connecticut

ESPEY MANUFACTURING COMPANY, INC.
New York, N. Y.

EVEREDY COMPANY, INC.
Frederick, Maryland

GENERAL MOTORS CORPORATION
Fisher Body Detroit Division,
Ternstedt Manufacturing Div. No. 9,
Detroit, Michigan
Oldsmobile Division,
Kansas City, Missouri

HYDRAUMATIC MACHINE CORPORATION
New York, N. Y.

INDEPENDENT ENGINEERING COMPANY
O'Fallon, Illinois

INTERNATIONAL BUSINESS MACHINES CORP.
Poughkeepsie, New York

INTERTYPE CORPORATION
Brooklyn, N. Y.

JARECKI MACHINE AND TOOL COMPANY
Grand Rapids, Michigan

KENT METAL & CHEMICAL WORKS
Edgewater, New Jersey

MC GRAW ELECTRIC COMPANY
Toastmaster Products Div.,
Elgin, Illinois

MID-WEST FORGING & MANUFACTURING CO.
Chicago Heights, Illinois

HERMAN NELSON CORPORATION
Moline, Illinois

PACKAGE MACHINERY COMPANY
Springfield, Massachusetts

PAYNE FURNACE & SUPPLY CO., INC.
Beverly Hills, California

RAYBESTOS-MANHATTAN, INC.
Raybestos Division
Bridgeport, Conn.

REEVES SOUND LABORATORIES
New York, N. Y.

THE ROLA COMPANY, INC.
Cleveland, Ohio

SCOTT & WILLIAMS, INC.
Laconia, New Hampshire

UNITED AIRCRAFT PRODUCTS, INC.
Vernon, California

NAMES THAT *Spotlight*

AMERICAN AIRCRAFT MOTOR SUPREMACY . . .

ALLISON
CONTINENTAL
PRATT & WHITNEY
RANGER
ROLLS-ROYCE
WRIGHT-AERONAUTICAL

BUICK
CHEVROLET
DODGE-CHRYSLER
NASH
PACKARD
STUDEBAKER

Content with nothing less than precision to the nth degree . . . these names point the spotlight of world-wide supremacy on the American aircraft motors of today.

And the name **WESSON** spotlights the Carbide Cutting Tools that helped such leaders tool up for this undreamed of production.

Today, these manufacturers have the job licked . . . are far out in front on what was once considered an "impossible" schedule . . . the world's greatest achievement in organized precision production, in which **WESSON** is proud to have had an important part.

Today **WESSON** engineers, skilled in engineering and production of cutting tools, are combining their "know how" with "can do" action in tooling up to help solve present war production problems as well as in post-war planning.

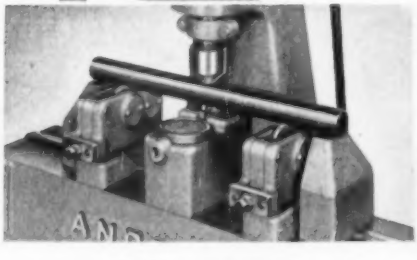
WESSON CO. DETROIT, MICH. (Ferndale Station)

WESSON
Carbide Cutting Tools
The name to rely on . . . no matter how tough the metal . . . for special or standard jobs . . . single or multiple setups.

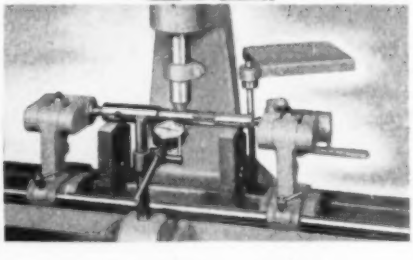
WHEN THE LIGHTS GO ON AGAIN all over the world, war-acquired precision will turn spotlights on those manufacturers who apply the benefits gained by using WESSON Carbide Cutting Tools . . . to machine the modern tougher metals better, at less cost . . . with fewer, simpler set-ups . . . with bigger bites of metal at greater speeds . . . with greater precision, finer finishes . . . for the good of all humanity and a better world in which to enjoy Peace!

HYDRAULIC HAND PRESS

For High Speed CHECKING AND STRAIGHTENING



EQUIPPED WITH DISCS



EQUIPPED WITH CENTERS

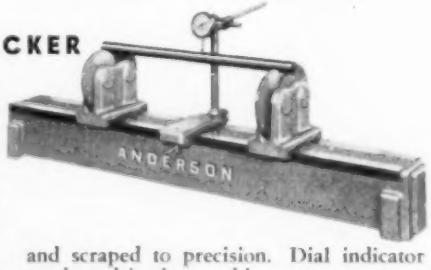
Checks and Bends in Same Position...

Eliminates Moving Shaft from Anvil to Centers for Checking

When pressure is released the spring tension on rolls brings the shaft free of the anvils and free to rotate for checking. Checking rolls are easily adjusted for various shaft lengths and can be removed altogether if necessary. Press is equipped with an indicator gauge calibrated in thousandths of an inch for locating high and low spots on shaft. Also a pressure gauge calibrated in pounds. The exact tonnage required to straighten any shaft can be quickly determined by the operator. This time-saving unit is operated by a hand hydraulic pump with a capacity up to 20,000 pounds.

The Anderson Hydrualic Hand Press is a high production machine that will pay good dividends in any plant where a quantity of shaft straightening operations are performed. Send prints or sample parts for our recommendations regarding size of machine best adapted to your particular needs.

High Speed ROTO CHECKER



Designed for speed and accuracy in checking straight shafting, tubing, and pieces having the same diameter at both ends. The work is mounted directly on discs which rotate on supersensitive ball bearings. Time customarily used for cleaning and conditioning centers is eliminated, also the time for mounting between centers. Balancing can also be handled by this machine. Base is of sturdy design, well ribbed and scraped to precision. Dial indicator graduated in thousandths.

Write for Details to ANDERSON BROS. MFG. CO., ROCKFORD, ILL.

Anderson SHOP TOOLS

POWDER METALLURGY

(Continued from page 106)

In this case the sintering of the iron powder particles is due to the fact that they have been pressed in close contact with each other and that at the sintering temperature the mobility of the atoms is great enough to bond the particles together.

The furnaces used for sintering have several closely controlled temperature zones. This is for the purpose of accurately controlling the rate at which the parts are heated which in turn determines the uniformity of dimensional change. Furthermore, the furnaces must be provided with controlled atmospheres in order to prevent oxidation of parts while sintering. The furnaces are either gas-fired muffle or electric furnaces.

DETERMINE THE SAVINGS

The tolerances on parts produced by this method cannot be held as closely in the direction of pressing as in a direction perpendicular to that of pressing. Where close tolerances in length or direction of pressing are necessary, it may be necessary to resort to machining to get the necessary tolerance.

In appraising powder metallurgy as a production method it must be considered in each case whether it competes with other methods of production or whether parts are to be made which cannot be produced by any other method. The molding of gears and other special shapes is an example for the first type of application, where much machining is avoided and yet close dimensional tolerances are attained.

Whether the savings due to the elimination of machining will be great enough to compensate for the increased cost of raw material depends upon the length of the production run, the availability of equipment, and other factors, and the answer to this question may vary in different shops.

ADDITIONAL ADVANTAGES

To the layman this elimination of machining frequently appears as the chief, if not the only, advantage of powder metallurgy. However, there are numerous applications where parts can be produced by powder metallurgy with special properties not attainable by other methods. For instance, metals can be combined which do not alloy in ordinary melting technique, or metals and non-metals can be combined as in the case of the addition of graphite in bearing compositions and friction materials to prevent seizure. Porous metal bearings are another example of a product which cannot be obtained by other means.

Powder metallurgy products may be made with a wide range of physical properties depending on the material and processing selected for a given piece. However, once the physical properties desired are chosen, all subsequent pieces can be made according to the same procedure with a very small variation in physical properties from piece to piece.

For example, a part made from iron powder might be made of a tensile strength between 18,000 and 50,000 lbs. per sq. in. by varying the briquetting pressure and sintering procedure. Such a variation in tensile properties may also be attained by the selection of the raw material used.

This introduces one of the most im-

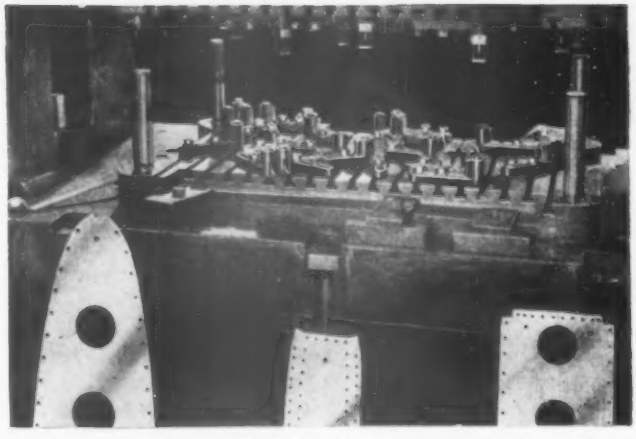
(Continued on page 150)

ADJUSTABLE DIES
SPEED WAR PRODUCTION

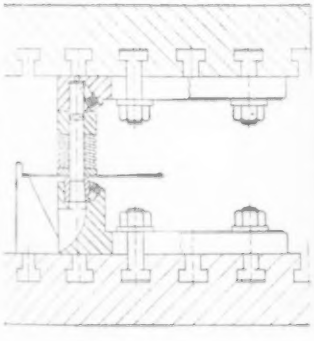
INCREASE HOURLY PRODUCTION—REDUCE "DOWN" TIME

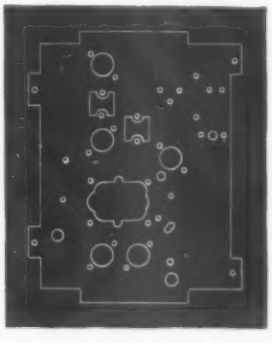
Whistler adjustable die set-up for 12 foot power brake. These same punch and die units can be quickly rearranged for other patterns.

Whistler Adjustable dies are saving the day in war plant "speed-up" schedules by... saving weeks of time normally required in single purpose die making... units can be used over and over in different patterns... new set ups on or off the press in minutes... all parts interchangeable ...work on any type press... perfect precision on long or short runs... no special tools and new workers quickly learn to make press changes.

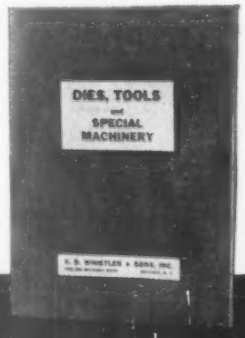


Another grouping of Whistler Adjustable Dies illustrating re-use of same units. Note close grouping of perforations.





Side view showing construction detail of U-50 Whistler Adjustable Punch and Die unit and typical example of perforated and notched piece produced by Whistler Dies.



Over 25 Years of Tool and Die Making Experience

S. B. WHISTLER & SONS, Inc.

752-756 MILITARY ROAD BUFFALO, N. Y.

Every Production Executive needs this fully illustrated catalog. Sent upon request.

SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT

A Steel Knot

ONE STEEL

that gives you . .

1. High Speed Machining
2. Greatly Increased Tool Life
3. Smooth Finished Parts
4. High Physical Properties
5. Excellent Impact Resistance
6. Good Torsional Values
7. High Case Hardness
8. Great Core Toughness
9. Reduced Carburizing Time
10. Unusual Ductility
11. Minimum Distortion

ACTUAL PHOTOGRAPH
Speed Case Steel (.20 carbon) 1-inch cold drawn bar tied in a knot, cold, without fracture.

SPEED CASE STEEL . . .
CARBURIZES in less time with *High Case Hardness . . . Core Toughness* and *Minimum Distortion.*
WRITE US! *Our metallurgists are at your service.*

BUY WAR BONDS

Licensor
MONARCH STEEL COMPANY
HAMMOND · INDIANAPOLIS · CHICAGO
PECKOVER'S LTD., Toronto, Canadian Distributor

Licensee for Eastern States
THE FITZSIMONS COMPANY
YOUNGSTOWN, OHIO

(Continued from page 148)

portant phases of working with powdered metals, and that is the necessity for maintaining strict control when it appears impossible to do so.

The answer is found in close application of laboratory methods all the way through production. Moisture in the powder mixtures used in briquetting many products is one of the things to be reckoned with. When powder mixtures absorb moisture they do not uniformly fill the dies. This had led to the air-conditioning of the work spaces where powder metallurgy products are pressed in order to maintain the moisture content at a uniform value.

Each operation in the processing of powder metallurgy products must be carefully controlled and its effect known in order that the finished product is obtained with known dimensions and physical properties. For this reason, the particle-size distribution of the powders going into the mixture, the density to which they are pressed, the temperature, time, rate of heating used in sintering, must all be known and controlled in order to attain a satisfactory product.

VARIATION IN PARTICLE-SIZE

It is impractical and uneconomical to secure powders which are all of one particle-size or even a narrow range of particle-sizes. For this reason, most commercial powders are supplied in a range of particle-sizes whose distribution remains fairly constant. Care must be observed in the handling of these powders that no segregation takes place of the larger and finer particles as well as segregation of the ingredients of the mix. When such segregations occur, variations result in the quality of the product.

A factor which must be considered in briquetting with metal powder is the variation in density from the top to the bottom of the piece. This is caused by friction of the particles of powder on the sidewalls of the die. When metal powders are pressed they do not behave as a plastic and, therefore, do not flow around corners.

SHAPE IS LIMITING FACTOR

This introduces a factor which must be considered a limitation of the powder metallurgy process in that articles having re-entrant angles cannot be made from metal powders satisfactorily. Objects such as flanged bearings or "L" shaped objects may be made, however, by separate movements of punches. The flange is made at the top and pressed by an upper punch while the body of the part is made lower in the die and pressed upward by means of a lower punch.

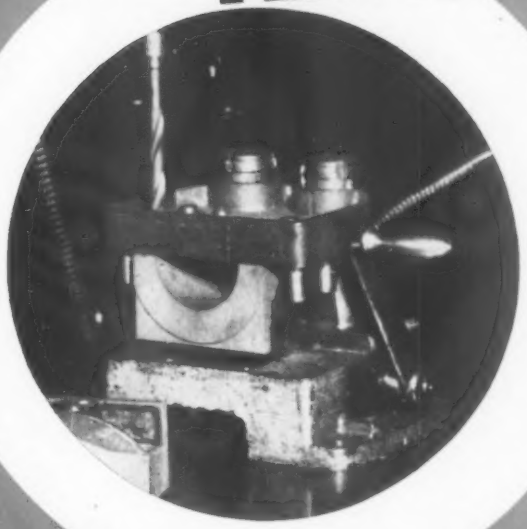
This illustrates a rule which has few exceptions: variations from straight cylindrical design are permissible if the progression of dimensional change is such that the die's general proportions are larger at the top, and that no diameter or other dimension within the die is greater than any above it.

In other words, every contour to be filled with metal powder must be directly affected by the downward stroke of the top punch or upward stroke of the bottom punch.

There are carefully studied and planned exceptions, and to some extent flow characteristics are improved by the addition of lubricants to the powder compound. However, in almost every instance, a sacrifice in the physical characteristics or design strength of the

(Continued on page 152)

BULL'S-EYE PERFORMANCE



SIEWEK

RAPID CLAMPING DRILL JIGS

SPRING, or RACK and PINION TYPES • SQUARE or OVAL TOP PLATES • WIDE RANGE OF SIZES

Including the famous Siewek Automatic Fixture Lock: Positive, Chatter-Proof, No Back Lash

● Straight to the heart of the drill jig problem goes the fast accurate performance of the Siewek line of Rapid Clamping Drill Jigs. They feature ample loading clearance, chip clearance and lubricating clearance. Users say they are absolutely unique for parts that come within the interchangeable class.

Contact a Siewek representative in your territory or write us.

Send for Catalog No. 5.

SIEWEK TOOL DIVISION
of DOMESTIC INDUSTRIES, INC.
DETROIT (FERNDALE STATION) MICH.

REPRESENTATIVES IN PRINCIPAL CITIES

Designers and Builders of
JIGS • FIXTURES • FIXTURE LOCKS • END MILLS

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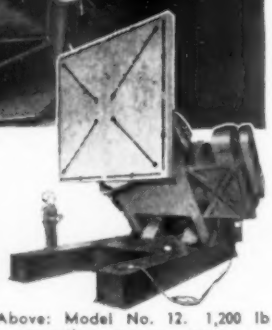
Affiliated with
SIEWEK ENGINEERING DIVISION
a nationally known organization staffed with experienced engineers — Consulting, Processing, Designing, Fabricating and Efficiency Methods.
CHICAGO DETROIT HARTFORD

A Better Positioner for every welding job

No matter what type welding you do there's a C-F Positioner exactly suited to your requirements. Ranging from small hand operated models like the one above to the giant, push button controlled, monster shown below, C-F Positioners revolve weldments a full 360 degrees, tilt them to 135 degrees beyond horizontal—permit down-hand welding of all sides with a single set-up. All are universal tools; *are adjustable for height*, handle a wide range of work and are pedestal or boom mounted to give maximum floor and working clearance.

Write for Bulletin WP-22.



Above: Model No. 12. 1,200 lb capacity manually operated.

CULLEN-FRIESTEDT CO., 1318 S. KILBOURN AVE., CHICAGO 23, U. S. A.

PRECISION THREAD MILLER

FULL AUTOMATIC CONTROL

INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT

The James **COULTER** *Machine Co.*

BRIDGEPORT • CONNECTICUT • U. S. A.

(Continued from page 150)

product is made by diversion from the general rule.

Perhaps acknowledgment of these disadvantages is most important in the light of acquainting the layman with the fact that powder metallurgy is faced with numerous problems, and that not every use suggested by some adherents can be fulfilled at present.

That there is a promising future for this method of fabrication cannot be denied. The very faith of men who have spent a working lifetime in its development is testimony to this. Though theoretically, there may be few limits to what may be tediously produced by this general process, production economy does impose severe limits.

FUTURE OF POWDER METALLURGY

The important thing to remember is that few advocates of powder metallurgy look forward to a time when this branch of metal working will take over in a wholesale manner. They will be satisfied generally if it assumes a place in industry comparable to that of forging, die casting, screw machine application or any of the processes which produce complete or nearly finished products from a processed raw stock—but which cannot replace all other methods. That goal may not be far in the offing.

Despite design limitations with regard to undercuts, which will not transmit compression from the punch, and other restrictions, a multitude of parts can be produced from powdered metals. To consider the aforementioned oil pump gear, or any small gear whose physical requirements do not exceed those which pressure and sintering can provide, a perfectly formed involute can be produced without need for an undercut at the root or base circle as is necessary when machining in order to afford cutter or hob clearance.

Numerous such design achievements can be chalked up over machining from bar stock, castings or forgings, where certain functional advantages afforded by design must be sacrificed in order to provide tool clearance or overcome chucking difficulties—or where production is slowed in the attempt to fulfill requirements unless special tooling is provided.

POROSITY IS OBTAINABLE

In certain applications, powder metallurgy has provided production methods as well as a product which can hardly be equalled by other manufacturing processes. Self-lubricating bearings are one of the most important contributions. Control of porosity in the bearing and other physical characteristics have made possible this unusual mechanical device.

Another product in which porosity control is important is the filter used to protect orifices in diesel injector nozzles. Low flow resistance, but excellent characteristics for trapping solids make it suitable in this instance. Because aperture size can be closely controlled, this same type product serves to alter flow characteristics of a liquid or gaseous medium, as well as to diffuse gas.

A simple device which has economic value from the production standpoint, is an ordinary copper ring which can be produced more cheaply by briquetting and sintering than by cutting from tubing — when the material cost is figured.

An application which does not em-

(Concluded on page 154)

for the
Hard-to-get-at Places . . .
NORTON
MOUNTED WHEELS
AND POINTS
THAT'S one of the chief uses of these Norton spindle-mounted abrasive wheels—to grind in the hard-to-get-at places, especially on the many intricate, light metal parts used for airplanes.
Another important use in the airplane industry is for burring literally thousands of parts for both plane and motor.
And, of course, Norton Mounted Wheels and Points have been a favorite in the tool room for years for finishing dies and molds and for countless other jobs.
Norton Mounted Wheels and Points are available in nearly 200 standard sizes and shapes—in Alundum and Crystolon abrasives, in vitrified, resinoid and rubber bonds. Catalog 43-TE gives full information. Write for a copy.
NORTON COMPANY
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NORTON ABRASIVES

Carefully Tested Steels Insure WELDON Quality

To check accurately the exacting specifications of the high speed steels used in WELDON cutting tools, exhaustive chemical and physical tests are made by a staff of highly trained experts in the WELDON metallurgical laboratories.

No expense has been spared to provide these laboratories with the most complete and modern equipment necessary for thorough test and micro-analysis.

As a result the high quality of WELDON materials is safeguarded and the dependability of WELDON Tool performance is insured.

We can make immediate shipment of most sizes of WELDON End Mills. Write for stock list.

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

(Concluded from page 152)

ploy briquetting, but is none the less a product of powder metallurgy, is the manufacture of babbitt bearings. Babbitt, to attain its full advantage, must be a thin layer over a strong backing. Applications of more than .002" thick are subject to early fatigue, in that the soft babbitt absorbs the immediate burden of any load. Thin applications receive full support from a strong backing, yet provide the all-important surface characteristics.

By sintering a mixture of 60 percent copper and 40 percent nickel to strong steel strip, a surface is provided which is bonded to the steel, both mechanically and chemically. The strip is cut and formed into half shells for bearing components by conventional methods.

RENEGOTIATION

(Concluded from page 113)

many remaining years of their existence saturate the post-war market.

2. Recognition of the variable excess profits tax burden which falls more heavily upon our industry because of the greater expansion required of us in comparison with our normal output.

3. Recognition of the need of retention of earnings to provide cash reserves to maintain post war employment, research and development of product.

4. Recognition of the principle that only earnings after taxes, rather than before taxes, should be reviewed.

5. Recognition of the need to exempt from renegotiation that part of the life of a machine which is not expended in the war and which will thus be engaged on peacetime work.

NON-FERROUS METALS OUTLOOK BRIGHTER

Washington — A marked easing of ferro-alloys and many non-ferrous metals was evidenced in the WPB's recently issued 10th Material Substitutions and Supply List.

The list, prepared by the WPB Conservation Division, groups the materials most essential to the war program in three categories on the basis of current availability: Group 1—Materials in INSUFFICIENT supply to satisfy essential war demands; Group 2—Materials in SUFFICIENT supply to meet war needs; Group 3—Materials in EXCESS of essential needs and recommended as substitutes for scarcer materials.

Explanation: "The easing of many non-ferrous metals and ferro-alloys is not an indication that restrictions on their use can be lifted or that any of them will be available soon for general use," Howard Coonley, Director of the Conservation Division pointed out.

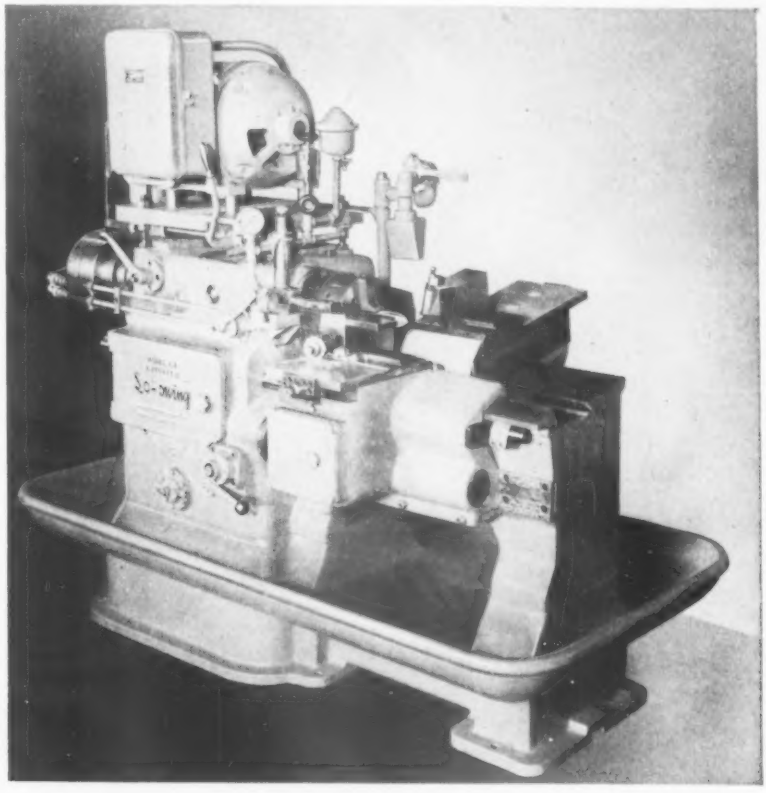
"The shift to Group 2," he said, "is significant chiefly because these materials in unfabricated form are now sufficient to supply essential war and industrial needs."

To advance the practice of substituting secondary alloys for more critical grades of material, the Conservation Division has prepared two charts for distribution: "Conservation Chart for Brass and Bronze", newly reissued, and "Aluminum Alloy Substitution Chart." Copies may be obtained from the Conservation Division, War Production Board, Washington, 25, D. C.

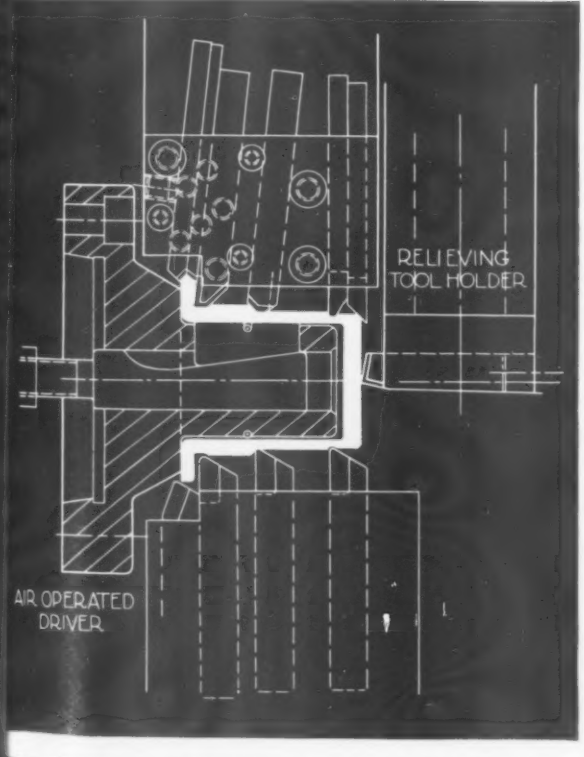
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

Illustration at right shows a Model LR *Lo-swing* Lathe equipped for turning points and bourrelet on small armor piercing shells. This same lathe, tooled as shown in the line drawing below, is used for the steel cup job described in this advertisement.



MODEL LR AUTOMATIC *Lo-swing* LATHE SPEEDS UP PRODUCTION ON CHUCK WORK



Problem: To automatically turn, face and undercut steel cups made from forgings.

Solution: The Model LR Automatic *Lo-swing* Lathe was selected for this job. The cups are held and driven on an air-operated, three jaw expanding arbor. The piece is located from the face of the flange on the open end, which surface has been previously faced to length from the bottom of the bore.

The three outside diameters and the flange are turned with four tools mounted on the front carriage, as shown in the tooling layout at left. All shoulders are faced, chamfered or undercut with tools mounted on the rear slide.

An important feature of this tool setup is the use of an Automatic Tool Relief Type Tool Block for the facing operation on the closed end of the cup. This type of tool block prevents "spiral scoring" of the face as the carbide tool is automatically relieved on the return stroke. Sintered carbide tools are used throughout for this turning operation.

Since the Model LR *Lo-swing* Lathe is completely automatic, it may be operated by unskilled operators who merely load and unload the parts and push the starting lever.

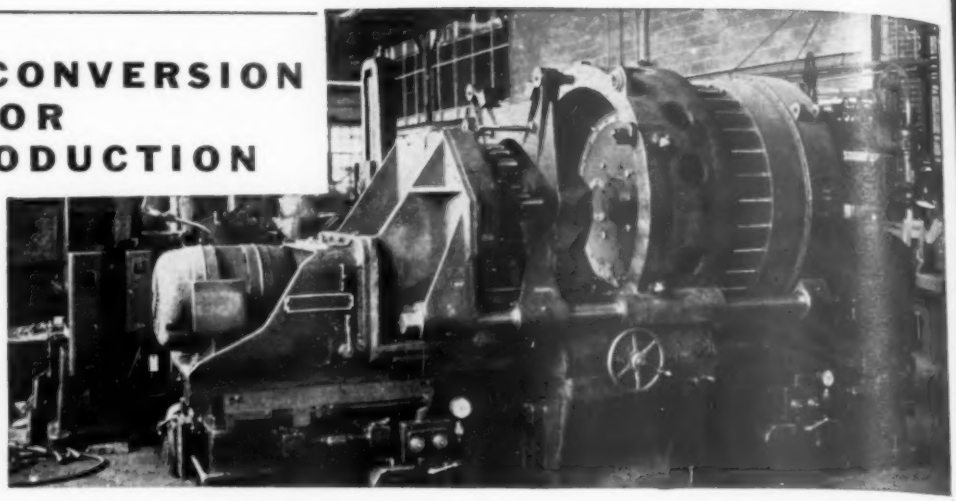
LATHE NEWS from SENECA FALLS

ANOTHER CONVERSION FOR HIGH PRODUCTION

BY A

Buhr

SPECIAL RETOOL



Tooling consists of a fixture for clamping an anti-aircraft part of which one side is a bushing plate. Right hand head has 82-spindles, and Left hand head has 38 spindles with a sliding bushing plate for removal of part from fixture.

All spindles have vertical adjustment for drill adjustment. An oil pump is provided in each head to insure positive lubrication to all ball bearings in the head.

These heads are direct motor driven and mounted on ways and are moved in and out by hydraulic cylinders.

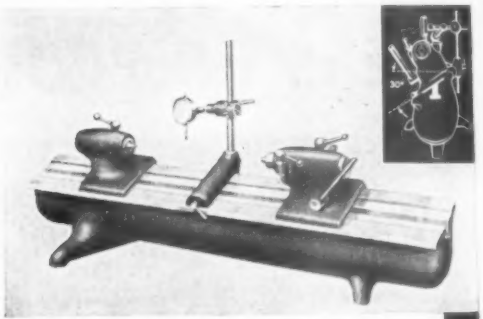
If you have a production problem, let Buhr engineers help you.

BUHR MACHINE TOOL COMPANY, • 833 GREEN STREET ANN ARBOR, MICHIGAN

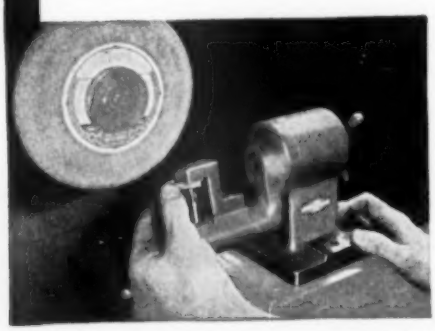
Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

GOOD TOOLS PROMOTE GOOD WORKMANSHIP

AMERICAN BENCH CENTERS will help you do better work. Improved design. Box section bed. Three point support. Always solid on bench. Inclined face. More room for operator's hands. Can't become "catch-all" for tools. Both heads adjustable. Retracting lever permits removal of work without changing adjustments. Three sizes: 8" x 36"; 6" x 24"; 4" x 10". Available also with riser blocks for checking work of larger diameters.



Improved Bench Center for testing and checking parts between centers.



Easily set to gage block accuracy. Z-block is clamped to swivel arm and removed after diamond has been set to correct radius.

AMERICAN RADIUS DRESSER is sturdy, compact, precision-built. Sets up quickly. Clears 7½" wheel and dresses convex or concave radii up to 1 inch. Swivel arm pivots on hardened and ground steel shaft; large thrust surfaces, dustproof bearings, constant lubrication.

Send for Bulletin 43-TE, with details on American Gages, Thread Checkers, Hole Checkers and Lapping Plates.

Base of radius dresser sets against straight edge of magnetic chuck.

THE AMERICAN GAUGE CO.

125 Bayard Street **DAYTON, OHIO**

"24 hours a day, 7 days a week"

"Have been cutting 3" sq. to 10" sq. slugs to lengths of from 3" to 15 inches, 24 hours a day, 7 days a week for the past 4 years and have been doing a very good job," reports this eastern forge company.

Faster-cutting than any other hack saws, these MARVEL 9A and 6A "Automatic" Production Saws are built for continuous heavy duty operation, with all moving parts operating on ball-bearings and with automatic bar push up, they require no more operating attention than an automatic screw machine.

The complete MARVEL line provides efficient metal-cutting saws that are exactly suited to the needs of every shop.

Buy from your local distributor

ARMSTRONG-BLUM MANUFACTURING CO.

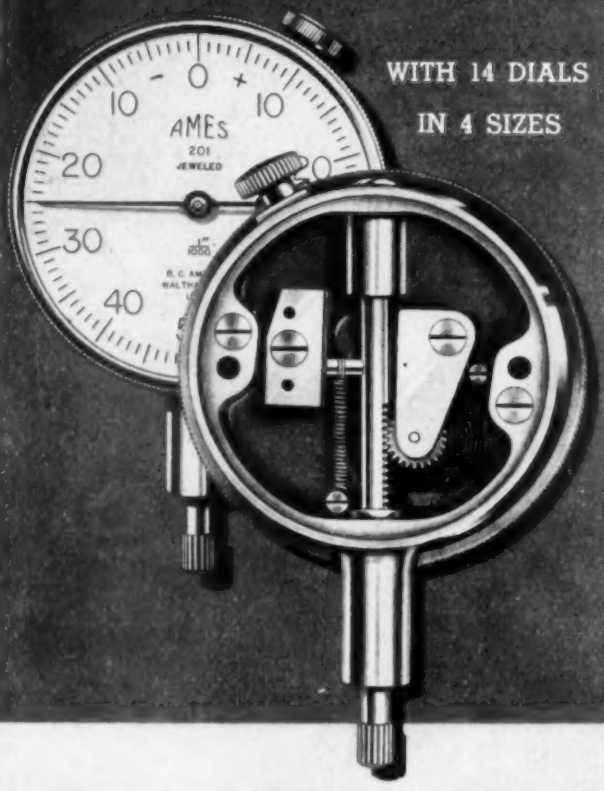
"The Hack Saw People"

Eastern Warehouse and Sales: 225 Lafayette St., New York, N. Y.

5700 Bloomingdale Ave. Chicago, U.S.A.

MARVEL SAWS

AMES *Hundred Series* DIAL INDICATORS



WITH 14 DIALS
IN 4 SIZES

A COMPLETE NEW SERIES

These Dial Indicators have all the desirable features for measuring and checking accuracy. Four sizes to American Gage Design Committee specifications. Fourteen different dial numberings. One-piece, drop-forged cases and stems. Wire attached bezels. Cup-shaped dials that need no springs beneath. Pinions and staffs of hardened steel, ground for accurate fitting and long wear. Various styles of backs and contact points. The best and most effective shock-absorbing wheel assembly, optional.

SEND FOR CATALOG NO. 52

B. C. AMES CO.
WALTHAM, MASS.

Ingenious New Technical Methods

Presented in the hope that they will prove interesting and useful to you.

Molten Metal Sprayed on Wood Patterns Prolongs Their Life

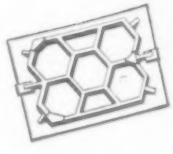
Molten metal sprayed on wood foundry patterns by a compressed air gun provides a protective coating against sand wear on the finished surfaces, thereby prolonging the life of the pattern and eliminating costly repairs.

The metal may be sprayed directly on the untreated wood surface of the pattern or core box. If the wood surfaces are hard or close-grained, a shellac primer is first applied, the metal being sprayed on before the shellac dries. The thickness of the metal coating is about 5 thousandths of an inch.

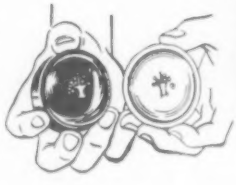
The spraying equipment consists of a portable, self-contained gun-type sprayer which melts the metal and is thermostatically controlled.

We hope this has proved interesting and useful to you, just as Wrigley's Spearmint Gum is proving useful to millions of people working everywhere for Victory.

You can get complete information about this method from Alloy-Sprayer Company, 2039 Book Building, Detroit, Michigan.



This wooden pattern coated with sprayed metal, has given service far beyond its normal life.



Fine detail easily recorded in the alloy sprayed onto pattern.

X-57

TO SPEED PRODUCTION HERE'S DOUBLE BARRELED ACTION!

WETMORE DESIGN FEATURES

No other reamers and boring bars have the combination of production-speed-up engineering features incorporated into Wetmore tools, such as: Rigid construction with patented blade lock and extra heavy blades, insures better finish without digging in or chatter . . . threads milled on centers, blade seats ground true with threads, and blades always bottomed, permits holding to close tolerances . . . blades may be set out 7 to 50 times, depending on size . . . and heavier cuts may be taken because of rugged construction, scientific grinding and quality materials. Wetmore tools have been known for years among top-flight metal working plants as the quality line, and Wetmore users represent practically a "blue-book" of American industry.

STOCK DELIVERY **Tool up now for higher war production, and be ready also for the post-war accumulated demand for consumer and other goods. Phone, wire or write.**

WIRE OR PHONE **us for quotations and delivery dates, and for the Wetmore Tool Catalog if you don't already have it.**

WE'VE STEPPED UP REAMER PRODUCTION

With new, single purpose high production machines installed in our plant, new expediting methods, and new planning schedules, we have been able to step up the manufacture of Wetmore Reamers and Boring Bars to the point where we can make stock delivery of standard types and sizes, and unusually good delivery on other items.

SO YOU CAN SPEED UP WAR PRODUCTION

The faster cutting and finer finishes you get on precision holes with Wetmore quality tools mean less machine time per piece . . . less manhours per piece . . . less spoilage . . . longer life of tools . . . less tool setting and maintenance . . . all of which add up to higher production and lower manufacturing costs.

REAMERS AND . . BORING BARS

WETMORE REAMER COMPANY
418 N. 27th St., Dept. C, Milwaukee, Wis.

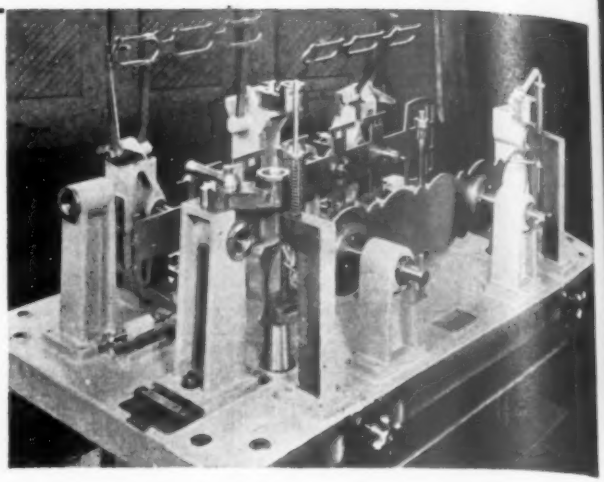
MERZ

Specially Designed Gages and Tools May Cut Production Time in HALF

★ ★ ★ Imagination, creative genius and practical *experience* combine to make MERZ special gages, tools and fixtures an investment that pays dividends in increased production and lower manufacturing costs.

Designed by our staff of seasoned engineers and manufactured to specified tolerances, they represent the highest skill and craftsmanship.

Our facilities and equipment are equal to the finest, and we are prepared to carry out a complete production tooling job, or the manufacture of a single gage, tool or fixture, as required.



A complete line of standard, plain and threaded, plug and ring gages carried in stock for prompt shipment. Write for literature describing the Merz "4 Spheres of Service to American Industry."

MERZ *Engineering Company*
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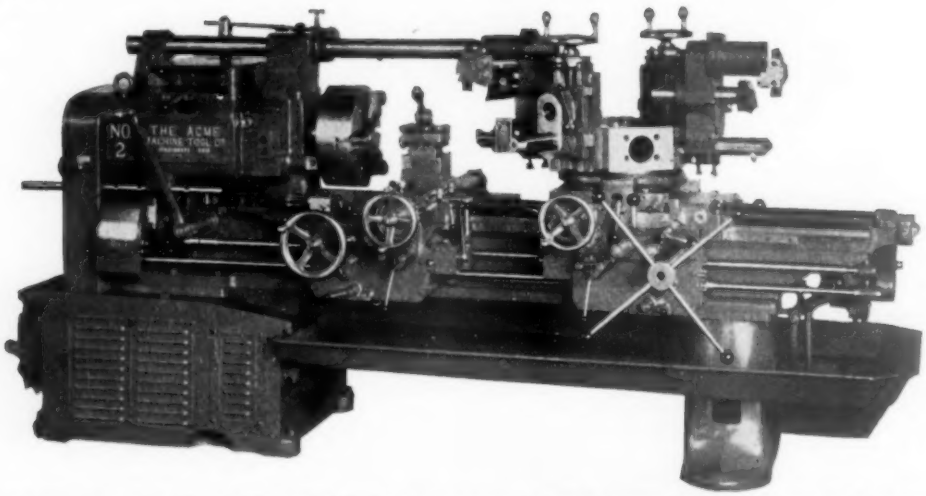
SPEED PRODUCTION--SAVE TIME

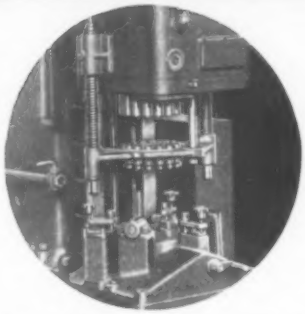


GREATER RIGIDITY AND ACCURACY UNDER HEAVIER CUTS AT FASTER SPEEDS!

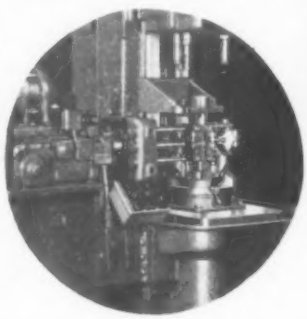
The above illustrated No. 2 ACME Universal Turret Lathe with its stationary overhead pilot bar and headstock brackets together with rigid turret tooling permits heavy multiple cuts. These features assure accuracy while faster speeds are possible through the use of cemented carbide cutting tools. This machine features heavy duty multiple turning heads and vertical side tools and heavy duty reversible cutter holders. Also shown is the lead screw type chasing attachment with split nut brackets and threading dials on both carriages. • WRITE FOR COMPLETE DETAILS.

THE ACME MACHINE TOOL CO. 4955 SPRING GROVE AVE., CINCINNATI 32, OHIO

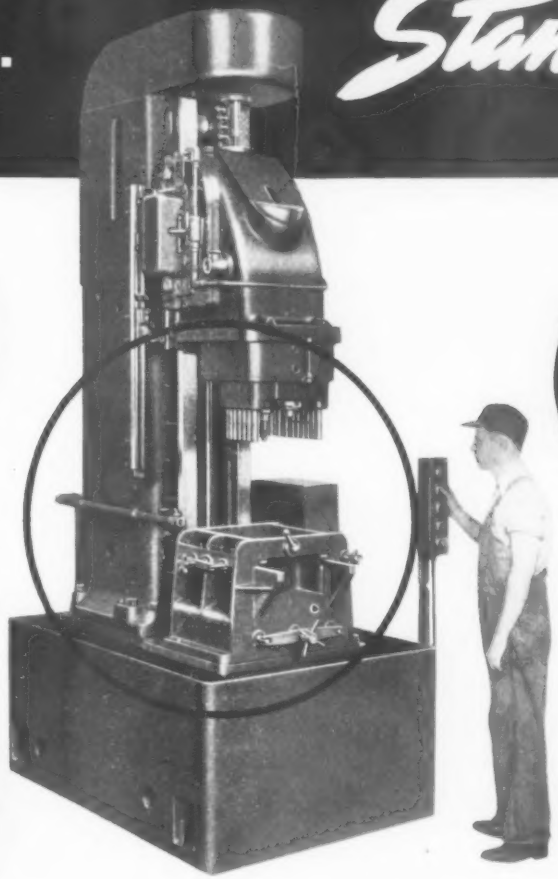
GET *Special* PRODUCTION MACHINING WITH THIS... *Standard* UNIT



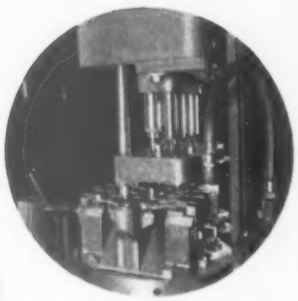
The 16-spindle drilling and reaming head shown above adapts the 914 machine to eight operations on seven different aircraft parts with only minor fixture changes. A 2-speed shift arrangement in the head provides a change from reaming speed on steel to reaming speed on aluminum, giving even greater versatility.



This W. F. and John Barnes 914 machine is one of the many such machines adopted by the automotive industry, and is assembled, as shown above, with an additional unit. This setup accomplishes drilling, boring and reaming operations on both left and right hand brake cross shaft brackets. Changes in design do not obsolete these machines since basic units are standard and only fixture and tooling design need be changed to meet new production requirements.



The W. F. and John Barnes No. 914 machine shown above is provided with 26 spindles for drilling and countersinking operations on a supercharger rear casing cover. With the exception of fixture and tooling design, this machine is standard in every respect.



Side links for chains were drilled from solid with W. F. and John Barnes 914 machine tooled, as shown above, with an 8-spindle drilling and reaming head and fixtures designed as illustrated. Four spindles are stationary. The other line of four spindles have adjustments to handle variance in center distance of from 3 to 4⅛ inches. A rotary indexing fixture table allows the operator to load four links while four are being machined.

Fixture and Tooling Only Engineering Required to Fit the 914 to Your Job.....

The W. F. and John Barnes 914 is a versatile standard machine of unit type construction designed for flexibility in drilling, reaming, boring, chamfering, milling, hollow milling and facing operations. Only changes in tool and fixture design are necessary to adapt this machine to a wide range of production jobs.

The 914 assembly consists of three elements — a base to mount the column, fixtures and to act as a storage for coolant when required; a column to carry the machine ways and to house the counterweight and drive motor; a sliding head unit to mount and feed tools and to house the hydraulic actuators.

To these standard units, tools and fixtures of appropriate design to meet your special production requirements are added. Changes in machining sequences or in the design of your product do not obsolete this machine since the basic assembly can easily be adapted to other types of work as shown here.

WRITE TODAY — For FREE 12-page Folder describing and illustrating the 914 Vertical Machine.

OTHER SPECIAL APPLICATIONS OF BARNES UNIT-TYPE MACHINES

Write today for this series of 8 Bulletins, each of which traces a machining problem from the preliminary survey to the final solution. Get valuable tooling suggestions that may increase your production efficiency. Ask for Bulletins 1143

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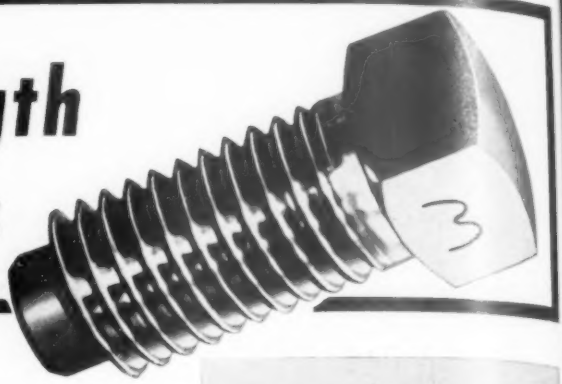

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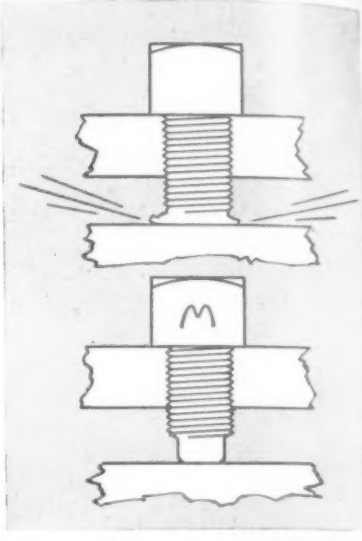

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IMPACT DIE FORGING

commercially known as

DROP FORGING

Copyright 1943—Chambersburg Engineering Co.

WHY A DROP FORGING?

A designer's decision to make a part by drop forging it, instead of casting it, or machining it from bar stock, depends on one or more of the following reasons:

1. For greater strength
2. Reduction in weight of finished part
3. Ability to withstand unpredictable loads
4. Minimum of machine finish required
5. Saving in material
6. Elimination of internal defects

Copyright 1943—Chambersburg Engineering Co.

Chart 1

Why a Drop Forging?

1. For greater strength

A die forged part of the same cross-sectional area as a casting is from 50% to 100% stronger. Because of this fact a drop forging may be designed with a considerably smaller section area, thus saving on the amount of metal required and reducing the cost of the part.

2. Reduction in weight

When comparing parts, all designed for the same working loads, but each designed for different fabricating processes, it will be found that a drop forging will be much smaller and lighter in weight. Therefore, when the design calls for great strength and light weight, a drop forging will naturally be selected.

Copyright 1943—Chambersburg Engineering Co.

Chart 2

Why a Drop Forging?

3. Ability to withstand unpredictable loads

When a part is forged, the metal is caused to flow, arranging the grain structure of the metal in the position most desirable for the requirements of the part. This grain structure, or grain flow, can be controlled as to density and the slip planes of the grains arranged in such a manner that they will withstand a high instantaneous stress. They will thus be able to take shock loads far exceeding the designed stress. This grain flow is illustrated in the following Chart.

Chart 3

Copyright 1943—Chambersburg Engineering Co.

Why a Drop Forging?

GRAIN

CASTING BAR STOCK FORGING

GRAIN FLOW

SECTION OF CRANKSHAFT, ETCHED TO SHOW GRAIN FLOW

Chart 4

Copyright 1943—Chambersburg Engineering Co.

Why a Drop Forging?

4. Minimum of machine finish required

In comparing a forging with a casting it is found that tolerances relating to size can be held to much closer limits than in sand castings of the same size and no allowance need be made for warpage as in a casting. Therefore, much less metal need be removed to bring the part to the finished size.

5. Saving in material

Since the machine finish can be held to such low limits, a drop forging when compared to bar stock or a casting will have relatively little machining scrap. For example, there is much less waste in the drop forging flash as compared to the gates and risers of a casting.

Chart 5

Copyright 1943—Chambersburg Engineering Co.

Why a Drop Forging?

6. Elimination of internal defects

Drop forgings are always made from solid metal bars, thus eliminating the hazard of blow holes often found in castings. Internal flaws in castings will result in rejection and scrap when such defects are discovered during machining, and unforeseen failures in service when *not* discovered in machining or final inspection.

Chart 6

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Above are part of a series of basic thoughts on the subject of Impact Die Forgings, incorporated in a course prepared for engineering schools and colleges by Chambersburg Engineering Co. Correspondence is invited.

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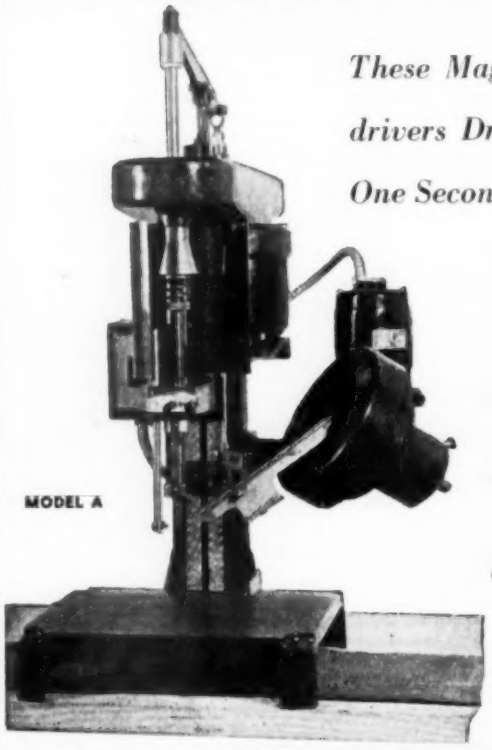
PRODUCTION DEPENDS ON RELIABILITY OF MACHINES



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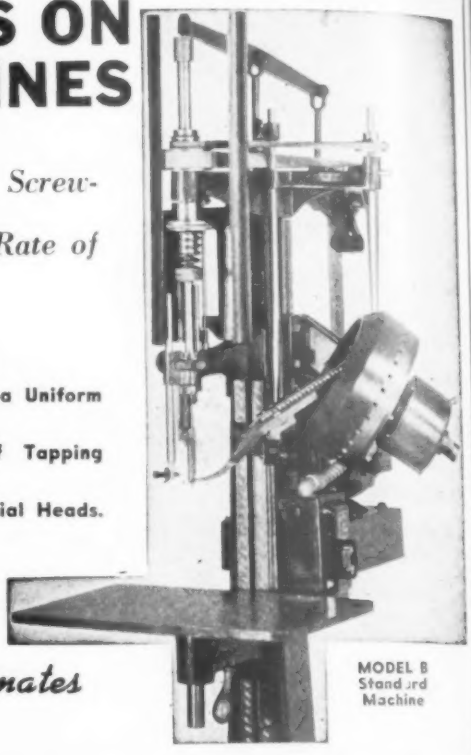

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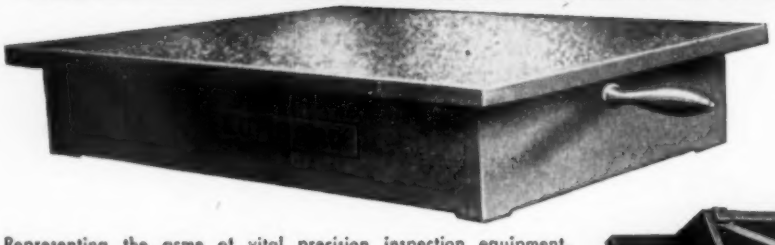

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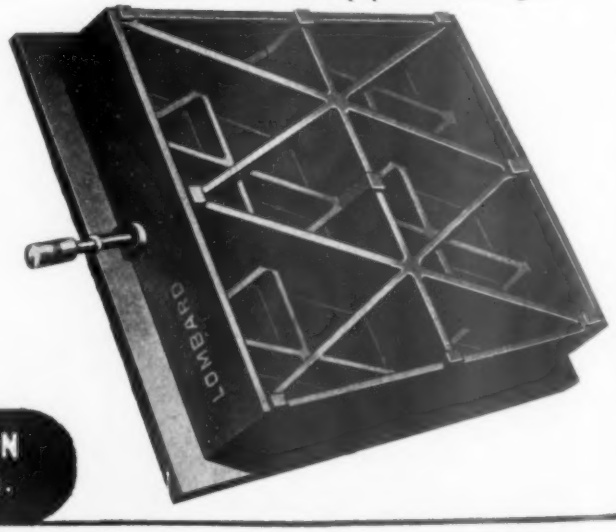
The Master Style	14"x18" to 48"x96"	.0001	.0003-4	.0005-.001
The Commercial Style	8"x12" to 48"x96"	.0002-3	.0005-.001	

Planer finish also available in both styles. All plates are furnished with lifting handles and finished wooden covers.



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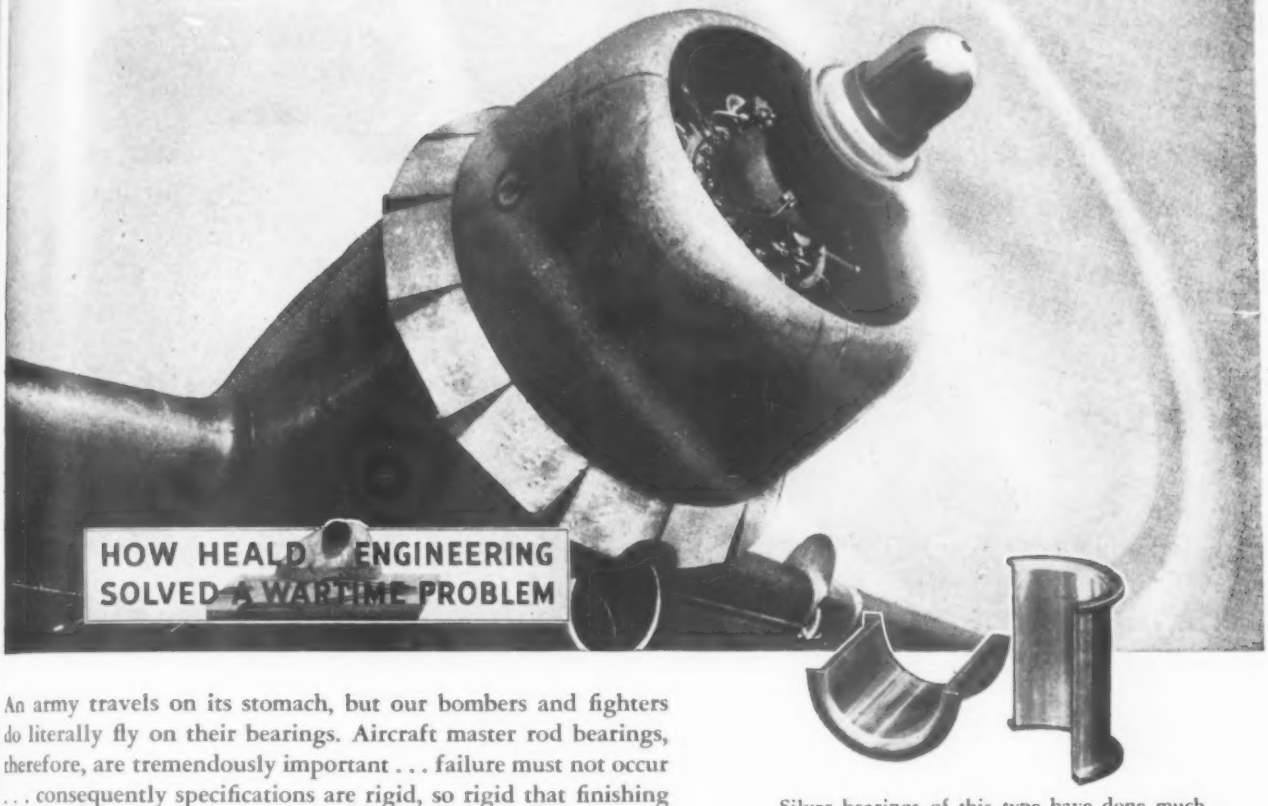

An army travels on its stomach, but our bombers and fighters do literally fly on their bearings. Aircraft master rod bearings, therefore, are tremendously important . . . failure must not occur . . . consequently specifications are rigid, so rigid that finishing presented a pressing wartime problem to the manufacturer.

Surface finish was of primary importance — was vital for bearings to stand up continuously under the merciless buffeting of 1200 and more whirlwind horsepower. Six microinches, the specifications called for, six millionths of an inch. Design, too, specified a very difficult contour bearing surface, with tapers at either end and a straight section between. And accuracy also had to be close, to .0002".

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Have you a wartime problem or do you need assistance in post-war planning? If it involves precision finishing, HEALD ENGINEERING is available, now, to help you.

The HEALD Machine Co., Worcester Mass., U. S. A.

Silver bearings of this type have done much to keep aircraft flying longer, fighting longer. For ultra precision, bearings are borized — to .0002" accuracy, 6 microinches finish.

Precision plus production in finishing aircraft bearings were both achieved with the development of the specially arranged Heald No. 47A Bore-Matic shown below. Machine features include a special contour boring head for boring straight and taper bearing surfaces in the same cut; many design refinements for obtaining surface precision of 4-6 microinches. The Bore-Matic handles both full round and split bearings.

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As shown at left, with the Sterling 1000, each grain cuts a microscopic furrow 3/16" in diameter. The furrows cross and re-cross each other cut at the rate of 4500 per minute, each at the same speed and at the same time, achieving a degree of uniformity and smoothness never possible with conventional, uni-directional sanding methods.

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Send for the new Hanna Catalog No. 233 covering Hydraulic Cylinders—and Catalog 230 giving full data on Low Pressure Cylinders.

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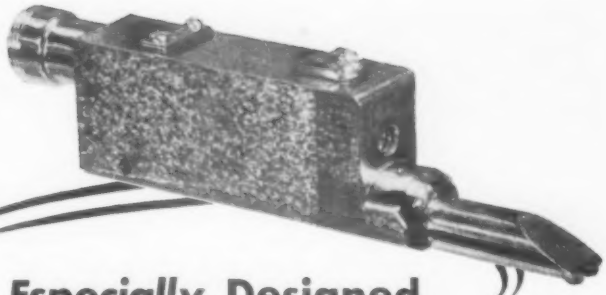
THE NEW TYPE J Profilometer* Tracer



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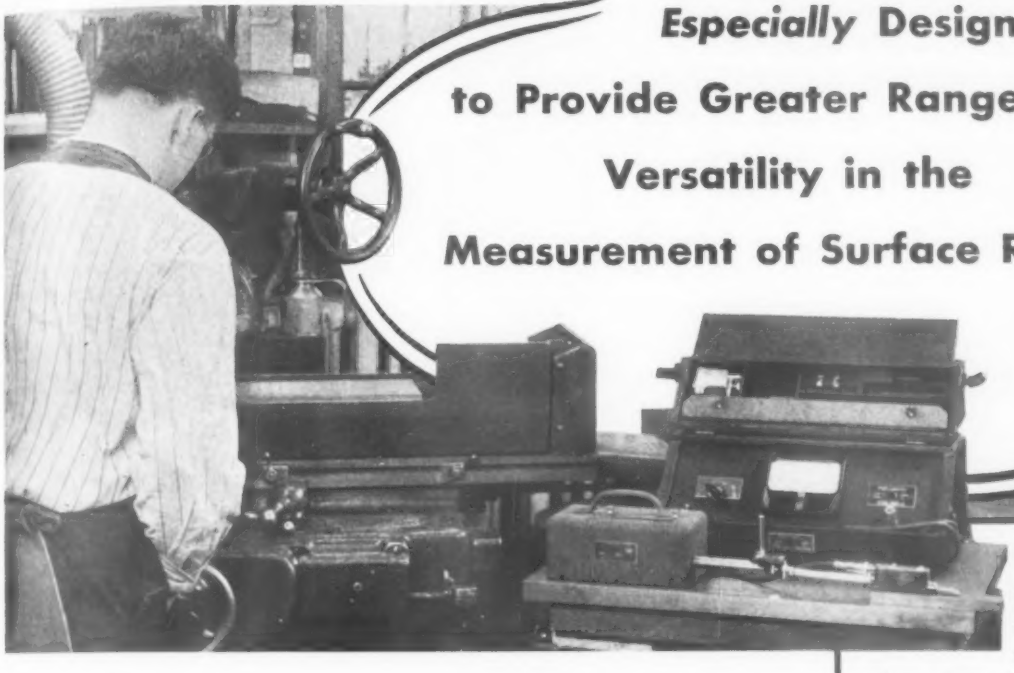

The Type J Tracer is designed for use with the new Type Q Profilometer illustrated here. Special adaptor cables can be supplied so that it may be used with Type P and PAC Profilometer

Present-Day requirements for measurement of hard-to-reach surfaces have resulted in the development of a new Profilometer Tracer, the Type J. For measuring small inside diameters beyond the range of the standard Type M, the Type J possesses even greater range and versatility than the Type I which it replaces. The new design is also more convenient in operation.

The Type J Tracer offers these advantages over previous designs:

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2. A convenient retractor button draws the tracer point well up into the snout when not in use or when positioning the tracer.

3. Overall height of the tracer has been reduced 5/16"—will trace completely through a 1 7/16" hole.

4. The Type J Tracer is considerably less sensitive to outside vibration, assuring extremely accurate readings at all times.

The Type J Tracer will measure a ½" hole to a depth of one inch and gear teeth as small as 10 pitch. For any application, it is recommended that mechanical operation with the Mototrace be employed.

Complete information on the Type J Tracer, the new Type Q Profilometer and the various Profilometer accessories now available will be supplied immediately upon request.

**Profilometer is the trade name registered in the U. S. Patent Office by Physicists Research Company.*

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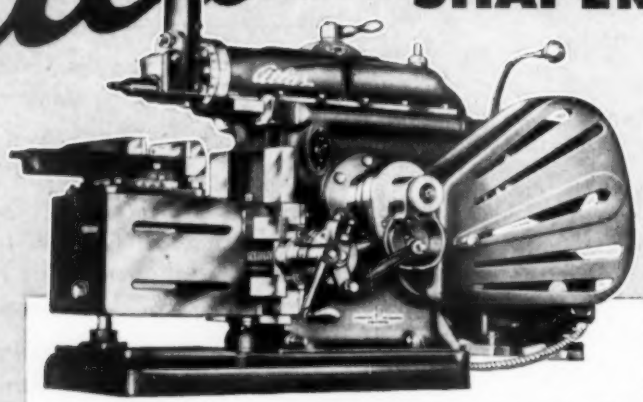

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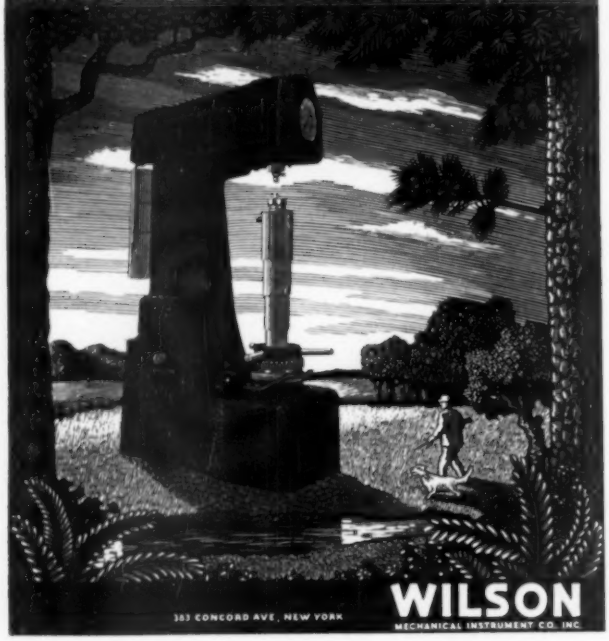

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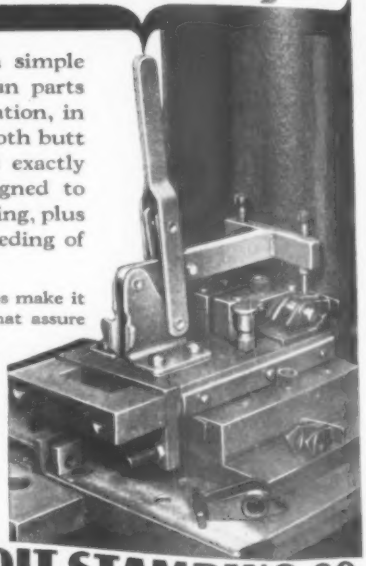
Illustration shows a simple jig clamping two gun parts for a surfacing operation, in such position that both butt surfaces are ground exactly parallel. Jig is designed to afford positive clamping, plus quick release and feeding of parts.



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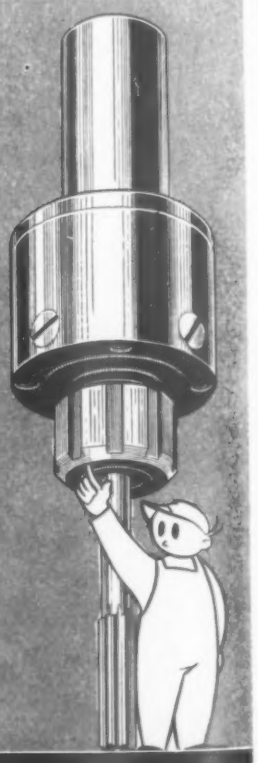
UNIVERSAL FLOATING CHUCKS •

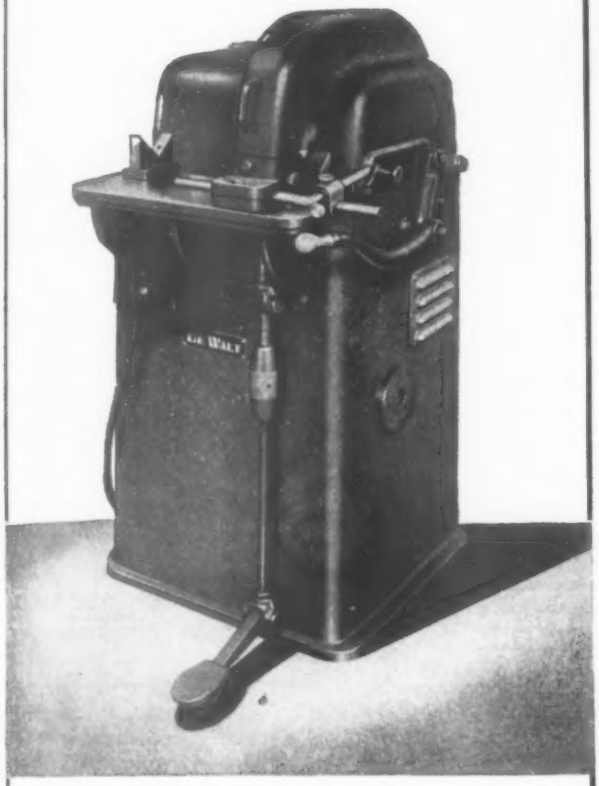
Universal Floating Chucks are the ideal tools for drilling, counter-boring, reaming or piloting from a lead hole. Adjustable spring pressure compensates for tool weight, allowing increased feed without danger of marred holes. Designed for horizontal operation in screw machines and turret lathes. Write for facts on Universal Floating Chucks, Standard Chucks and Centering Chucks.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

DeWALT

METAL CUTTING MACHINES



This compact, sturdily constructed High Speed Cutting Machine for light metals (Model ME-1), will cut ferrous and non-ferrous bar stock up to 1½"; light wall steel tubing up to 4" (Heavier wall tubing in non-ferrous); flat bar stock up to 1" x 4" (ferrous and non-ferrous); and extruded or small structural shapes up to 4" on a side.

Other DeWalts are:

- Foundry Metal Cutting Machine
- Tube Cutting Machine
- Wet and Dry Cutting Machine (ME-2)
- Heavy Duty Wet Cutting Machine (ME-3)
- Dual Column Metal Cutting Machine

DeWalt Builds a Complete Line of Metal Cutting Machines.

Write for descriptive literature

DeWALT PRODUCTS CORPORATION

Lancaster • Penna.

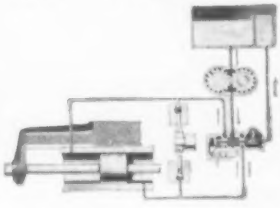
HOW TO IMPROVE both NEW DESIGNS AND CHANGEOVERS ...by using these UNIT-TYPE HYDRAULIC TRANSMISSIONS

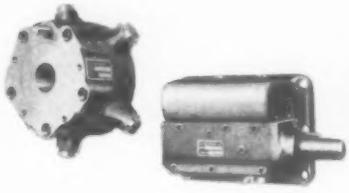
● Many manufacturers are now redesigning their machines to incorporate latest developments and improvements. Many have post-war developments in progress. Many are using and specifying Barnes Unit-Type Hydraulic Transmissions for smooth actuation as well as convenience and economy.

If you haven't investigated this modern simple way of improving your equipment do it today.

Here's how it's done:

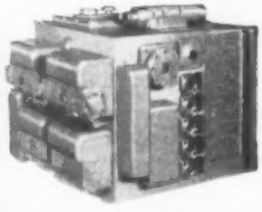
Complete circuits are designed from standard elements, pumps, valves, etc., making one supplier responsible for the successful operation of your hydraulics.

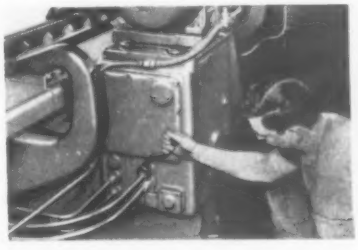




Barnes pre-tested and perfected elements such as pumps and valves are used in the proper circuit to suit your job.

The circuit is housed as a self-contained unit or panel and shipped to you for assembly. The panel assembly is ideal for applications where machine base serves as oil reservoir.





Merely connecting two pipes to each hydraulic cylinder and mounting the unit or panel completes the hydraulic installation.

FREE DATA 40-page booklet contains detail descriptions of all Barnes elements and typical installation circuits. Write for your copy today. Ask for bulletin T.E. 1143.

BARNES hydraulics

John S. Barnes Corporation

DETROIT SALES OFFICE
503 NEW CENTER BLDG.
TR-1-1706

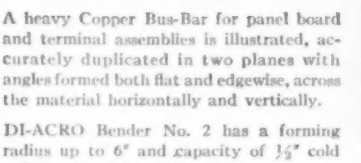
MAIN OFFICE AND FACTORY
ROCKFORD, ILL.

BUS-BAR

Formed in
2 PLANES to
.001" ACCURACY

WITH
DI-ACRO
BENDER
No. 2

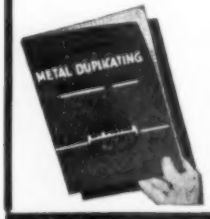
ONE-HALF ACTUAL SIZE



A heavy Copper Bus-Bar for panel board and terminal assemblies is illustrated, accurately duplicated in two planes with angles formed both flat and edgewise, across the material horizontally and vertically.

DI-ACRO Bender No. 2 has a forming radius up to 6" and capacity of ½" cold rolled solid steel bar or equivalent.

Many electrical and other parts can be duplicated without dies, saving Man Hours and Critical Materials and helping to meet rush delivery schedules. DI-ACRO Precision Machines — Shears, Brakes, Benders — form angle, channel, rod, tube, wire, moulding, strip stock; bi-metals, dielectrics, sensitized materials, fiber slot insulation, frequency reeds, etc.



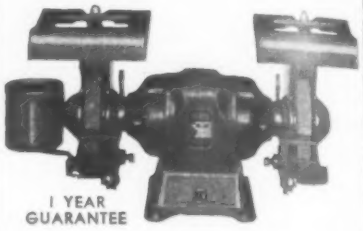
Send for Catalog
"METAL DUPLICATING WITHOUT DIES"

showing all models of DI-ACRO Benders, Shears and Brakes, and many examples of parts formed by **"DIE-LESS DUPLICATING".**

O'NEIL-IRWIN DI-ACRO PRECISION MACHINES MFG. CO.
307 Eighth Ave. So., Minneapolis 15, Minn.

BALDOR
BALL BEARING GRINDERS

Built For Heavy Production Service



1 YEAR GUARANTEE

New BALDOR Grinder No. 724

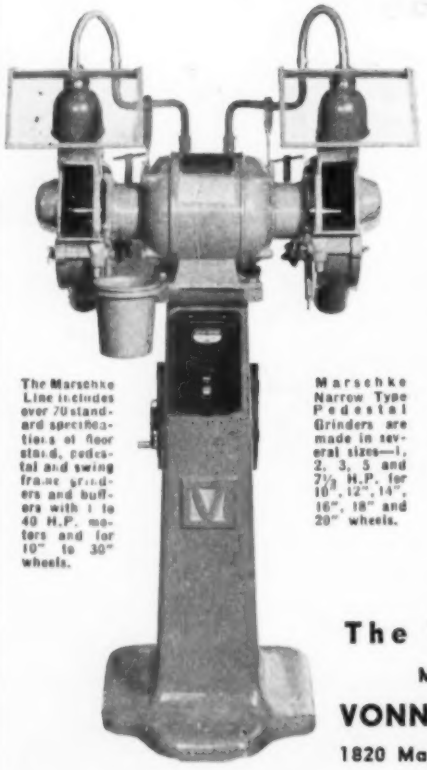
has separate, combination lights and eye-shields; tool rests are tiltable and adjustable to and from wheel and up and down; water pot; ½ HP motor, 3,400 r. p. m. 60 cycles. 7" x 1" ALOXITE wheels made by Carborundum Company. Price, without bulbs $49.50

Ask for BULLETIN 307 ON FULL LINE

BALDOR ELECTRIC COMPANY
4335 Duncan Ave., St. Louis 10, Mo.

BUILT BY MOTOR SPECIALISTS

MARSCHKE 1 H.P. Pedestal GRINDER



*shown with lights and eye shields . . .

The Marschke Line includes over 70 standard specifications of floor stand, pedestal and swing frame grinders and buffers with 1 to 40 H.P. motors and for 10" to 30" wheels.

Marschke Narrow Type Pedestal Grinders are made in several sizes—1, 2, 3, 5 and 7½ H.P. for 10", 12", 14", 16", 18" and 20" wheels.

For tool sharpening and other freehand precision grinding you will want a grinder with ***smooth, true spindle rotation.*** It saves high-priced grinding wheels and it accounts for better grinding. You get these basic requirements in the Marschke Pedestal Grinder. You also get the ***safe, time-saving, dependable*** Universally Adjustable Marschke Guards. This machine, as shown, is the best for tool sharpening and other freehand precision work but the same 1 H.P. grinder—without lights and eye shields—is available for general purpose and small parts production grinding. You will like this machine.

The "MARSCHKE LINE"
Manufactured and sold by the
VONNEGUT MOULDER CORP.
1820 Madison Ave. Indianapolis 2, Ind.

LESS OPERATIONS
AND FAR
BETTER WORK
WITH A
GATCO
ROTARY PILOT BUSHING

Pilot bushing fits with a PUSH fit, therefore a perfect bore

ROUND-CHATTERLESS-SMOOTH

DUST-PROOF

AS A WATCH

GATCO Rotary jig and pilot bushing is built for core drilling, diamond boring, turret tool piloting, piloting hollow mills, line reaming, carbide boring, spot facing, etc.

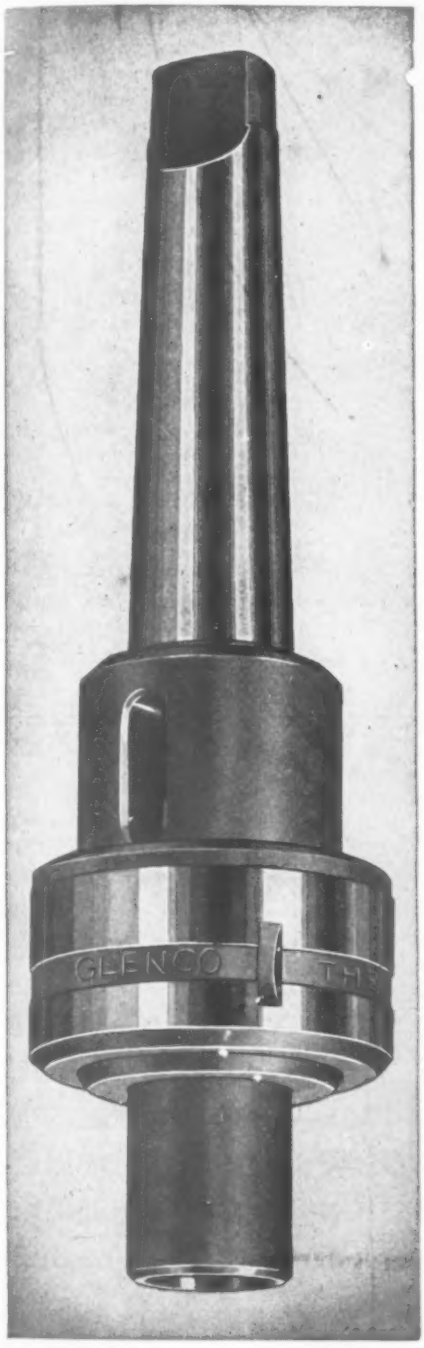
Write for full information and prices

GIERN & ANHOLTT TOOL COMPANY
1312 Mt. Elliott Avenue, Detroit, Michigan

GLENCO

FLOATING TOOLHOLDER

Corrects Machine Tool Misalignment By Producing TRUE and ACCURATE Holes



Also Manufacturers of

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FLOATING HOLDERS
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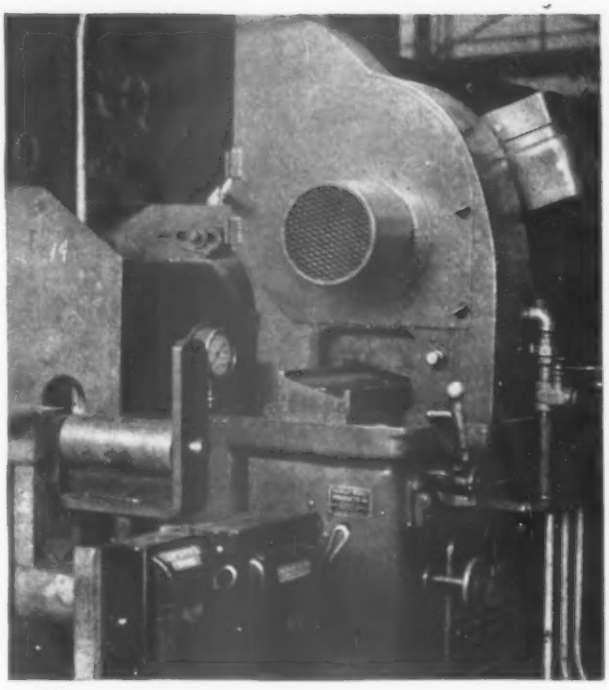


Campbell Abrasive Cutting Machines

HELP MAINTAIN SCHEDULES FOR GREAT STEEL MILL

CAMPBELL offers you the same service today that it offered the steel mill—one of whose CAMPBELL ABRASIVE CUTTING MACHINES is shown above.

All you need to do is send CAMPBELL Engineering Department data on your cutting—materials being cut, sizes, shapes, lengths before cutting, lengths of cut-off pieces and production you require per hour.

CAMPBELL engineers will then develop production procedures and costs—without any obligation on your part.

The sound foundation for this service is CAMPBELL'S experience and complete range—the only complete range—of Abrasive Cutting Machines.

These machines right now are cutting solid bar, tubular and flat stock—steels of all grades, annealed and unannealed; non-ferrous alloys; plastics; glass and ceramics. They have made it possible for many to meet wartime schedules.

Your letter will receive prompt attention.

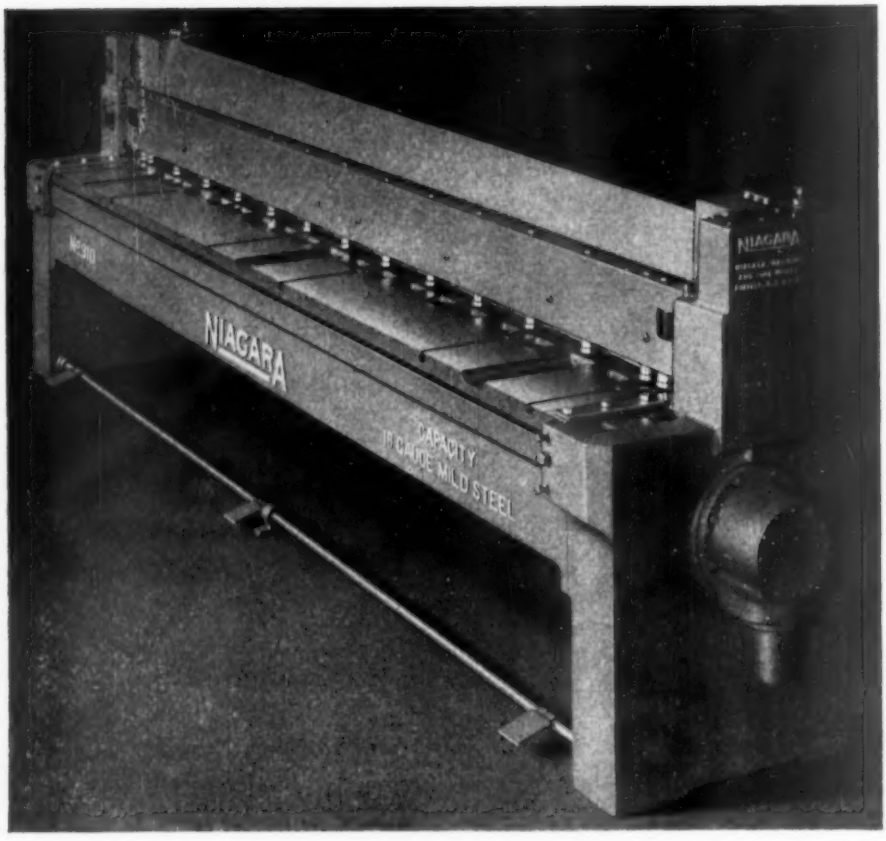
Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT



This Series No. 3 Niagara Power Squaring Shear is typical of the many sizes and capacities which are resulting in more production per hour. The Niagara line of shears is the most complete in the industry and offers the most economical answer to shearing requirements up to 20 feet. Niagara Machine & Tool Works, Buffalo 11, N. Y. District Offices: Detroit, Cleveland, New York.

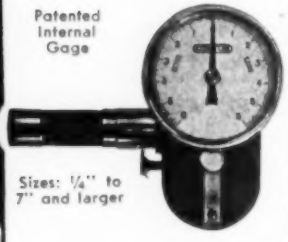
★

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory regrinding service by the same skilled men who grind new Niagara knives.

BUY UNITED STATES WAR BONDS AND STAMPS

A versatile high-accuracy gage for critical work

Trainees, Operators, Inspectors ALL use this versatile gage



This unique gage gives accurate analysis of a bore to fractions of .0001" whether in expert or relatively unskilled hands. Automatic features of self-centering and self-alignment assure positive 2-point gaging, enabling the user to detect front or back taper, out-of-round, bell mouth, barrel shape, etc. Not a passing reading. A favorite for airplane and automotive work, as well as ordnance items and all precision work.

Request Bulletin 29

THE COMTOR CO.

70 Rumford Avenue
Waltham, Mass.

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from simplest DIES to most exacting

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GAUGES — TOOLS — FIXTURES
JIGS — SPECIAL MACHINES
DESIGNING & ENGINEERING
HIGH PRODUCTION STAMPING

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BARTH STAMPING & MACHINE WORKS

Die & Tool Makers

W. 34th and Denison **Cleveland 9, O.**

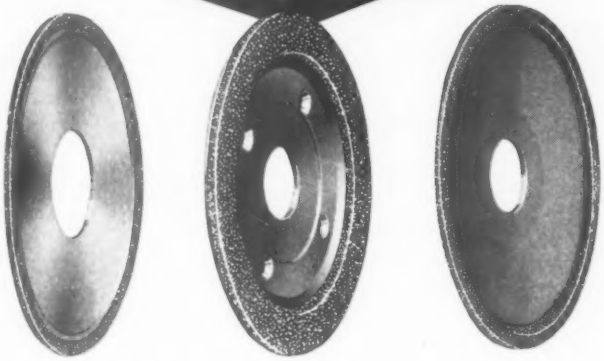
NEW SUPER-CUT

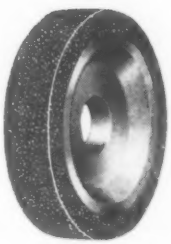
(DIAMOND BONDED WHEEL)

Sharpens Hardest Metals

Cuts Faster • Better • Smoother

and lasts much longer!





Proven by test to give greater service! Our special process of deeply imbedding quality diamonds in a new, tight gripping matrix, forms a uniform cutting surface with tougher-than-ever biting ability . . . yet it ***resists*** wear! The wide selection of sizes and shapes available enable ***production tested*** Super Cut Diamond Wheels to do any and every job with greater satisfaction than ever before! Chip Breaker—Deep Dish—Flared Deep Cup —Shallow Dish—Plain Cup—Small Periphery and many other periphery types now in production.

Shipments Made At Once! No Delay! Write Today!

Industrial Abrasives INC.

3724 W. 38th Street, Dept. 11-B, Chicago 32, Ill.

Ettco-Emrick TAPPING ATTACHMENTS

make tapping as easy as drilling . . .

Unskilled operators—men or women—can do fast, accurate tapping right on your drill presses with Ettco-Emrick Attachments.

The features which make this possible are:

1. The exclusive Ettco-Emrick friction clutch which provides the delicate sensitivity needed in tapping, particularly with the smaller size taps. It's as sensitive as a hair trigger.
2. Reverse is automatic.
3. Tap idles in the cutting direction, which prevents hole chamfering and preserves cutting edges.
4. All parts are designed and built for high-speed operation.
5. QUILL CLAMPS are available for mounting on any drill press with absolute rigidity, assuring accuracy.

ETTCO-EMRICK TAP CHUCKS

Grip is visible, assuring proper insertion of taps every time. 5 sizes, for No. 0 to 1" taps. Details in Bulletin No. 6. Collet type chucks available for No. 6 to ⅜" taps.

GET FULL DETAILS IN BULLETIN No. 2

Copy *mailed on request*

ETTCO TOOL CO.

586 Johnson Ave., Brooklyn 6, N. Y.

Detroit • Chicago

The Famous Ettco-Emrick DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

Make Every Job a "RINGER!"

Here Are Some HELPFUL HINTS

1—Set the work up right the first time. Utmost rigidity is absolutely essential. Use shims or jacks where necessary to keep the work from springing under the cutter.

2—Don't clamp directly onto polished surfaces. Insert something between. Otherwise it may be necessary to scrap the job after it is taken down!

3—Use correct wrenches. Wrenches too large will round the corners of nuts and induce slipping. Serious accidents result from slipping wrenches!

4—Clean arbor shanks and spindle interiors. Have the surfaces free from grease, and dry, to prevent slipping of arbor in spindle. Trouble usually follows a dirty fit!

5—Be sure of the "hand" of the cutter. Left hand cutters, hurriedly set up for a right hand job, may become badly damaged before the machine can be stopped.

6—Speed and feed MUST be right. This means the co-ordination of numerous variables. A heavy cut at low speed may not be as effectual as a light cut at a fast speed. Watch cutter speeds also. Running a cutter too fast dulls it, wastes power, leaves a poor finish. If in doubt, check your data again or consult your chief.

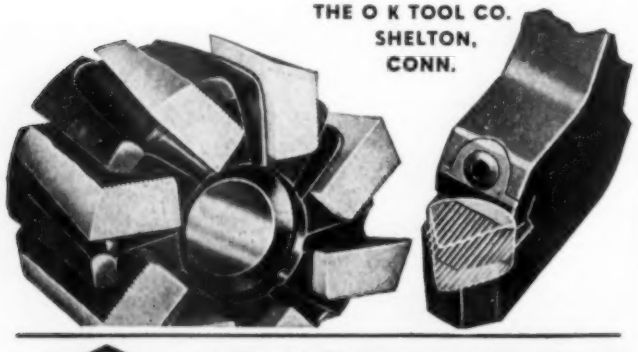
7—To maintain precision, keep cutters sharp.

8—Check for errors first, not after the work is started. One error passed may ruin valuable stock, waste hours of precious time.

9—Have everything at hand before starting the machine.

10—Last, but not least, don't force a cutter into the work when it is evident from the sound that something is wrong!

THE O K TOOL CO.
SHELTON,
CONN.



TRADE OK MARK SYSTEM
OF INSERTED-BLADE METAL CUTTING TOOLS

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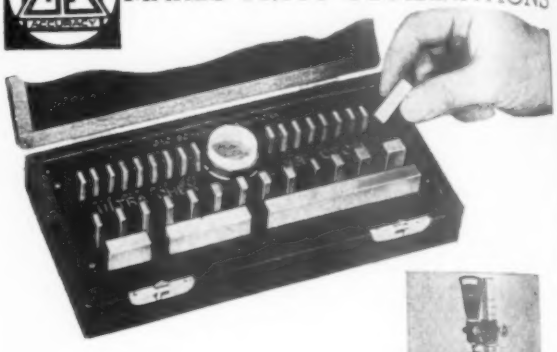
34 BLOCK ULTRA-CHEX MAKES 80,000 COMBINATIONS



The ULTRA-CHEX set shown above consists of 34 gage blocks which will make up about 80,000 combinations in steps of 1/10000" from .300" up to 8". These blocks are absolutely essential in precision and interchangeable manufacture. They make it possible for mechanics and toolmakers to produce work to specified limits of accuracy, to repeat precision work with assurance of interchangeability and to set and check measuring instruments to exact dimensions.

BEWARE OF WORN GAGE BLOCKS.
If your present set of gage blocks has been in use for sometime, the chances are it will have worn and may be undersize. Don't take chances on rejections. Order a new 34 block Inspectoset, check your used set, and you can easily compensate for any divergence from size.
ORDER YOUR SET TODAY. Price $125.00 including optical flat.

COMPARITOL for checking gage and work to 1/10000". $195.00

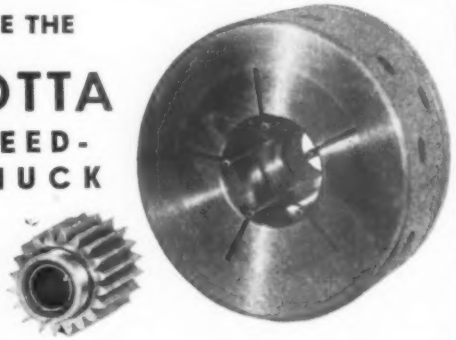
WILDER PROJECTOR for comparing by means of shadow image. $248.75

MAGNI-RAY illuminated magnifier for inspection. $18.50 $27.50

GEORGE SCHERR CO., INC.
132 Lafayette Street New York 13, N. Y.

USE THE

COTTA SPEED-CHUCK



FOR INCREASED GEAR PRODUCTION AND GREATER ACCURACY . . .

For operations where gears are to be chucked for hole or face grinding, or for boring or turning, the COTTA SPEED-CHUCK offers opportunities for substantial production economies and improvement in accuracy. The gear is held precisely centered with reference to its own pitch line, thus automatically eliminating errors caused by eccentricity. There are no levers, screws, or other clamping devices to operate, as the gear is gripped firmly against the direction of rotation by hardened pitch-line pins bearing on a set of accurately ground fixed cams. COTTA SPEED-CHUCKS are made to specifications for spur, helical, and step or cluster gears. Send print of gear for quotation.

CHARLES COTTA

1712 HARLEM • ROCKFORD, ILLINOIS

HANDLING A WIDE RANGE OF WORK WITH HILL HYDRAULIC SURFACE GRINDERS

★ Most HILL Precision Surface Grinders are purchased for a specific application, but all users of HILL Grinders find they are also ideally suited for a multitude of other operations.

It is this versatility that has resulted in HILL *"Open Side"* Hydraulic Grinders superseding other methods of finishing. The HILL grinder features massive construction, wide speed variation, 100% hydraulic drive, simplified controls, ample motor power for rapidly removing stock, and accuracy maintained within requirements. HILL Hydraulic Surface Grinders should have a definite place in the post-war planning of your revamped shop efficiency. HILL Grinders are built in both Horizontal spindle and Vertical spindle types in a wide range of sizes. Bulletin H-V-8 gives full details.

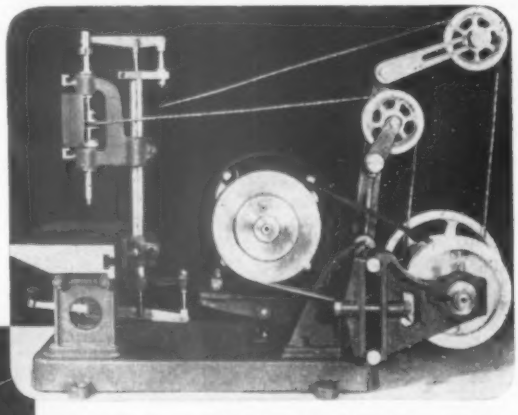
18" x 18" x 120" HILL *"Open Side"* Horizontal Spindle Hydraulic Surface Grinder, with magnetic chuck holding work in place.

The HILL ACME Co.

6400 BREAKWATER AVE. • CLEVELAND, OHIO

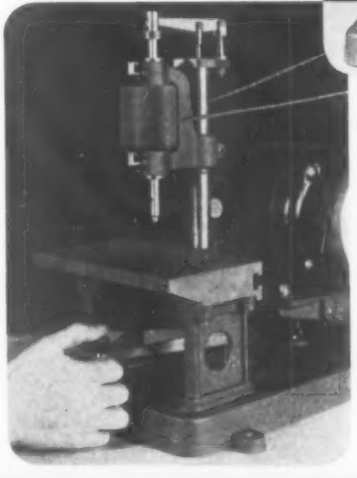
Have you tiny holes to drill? THEN INVESTIGATE THE *Super Sensitive*

L & D HIGH SPEED DRILL PRESS



Speeds from 3000 to 23,000 R.P.M. Available with one, two, three or four spindles.

The Super Sensitive L & D Drill Press is a production tool for the precision drilling of holes from 1/16" down to .004" (or smaller). Drills really cut on this machine, because speeds up to 23,000 R.P.M. are available. This positive cutting action, plus balanced, finger-tip control, give high production with a minimum of drill breakage—even with unskilled operators! The Super Sensitive is available with one, two, three or four spindles. The coupon will bring complete details — mail it today.



Please send me complete details on the Super Sensitive Drill Press.

Name..... Title.....

Company .....

Street .....

City..... State.....

T.E.

EDWARD BLAKE COMPANY

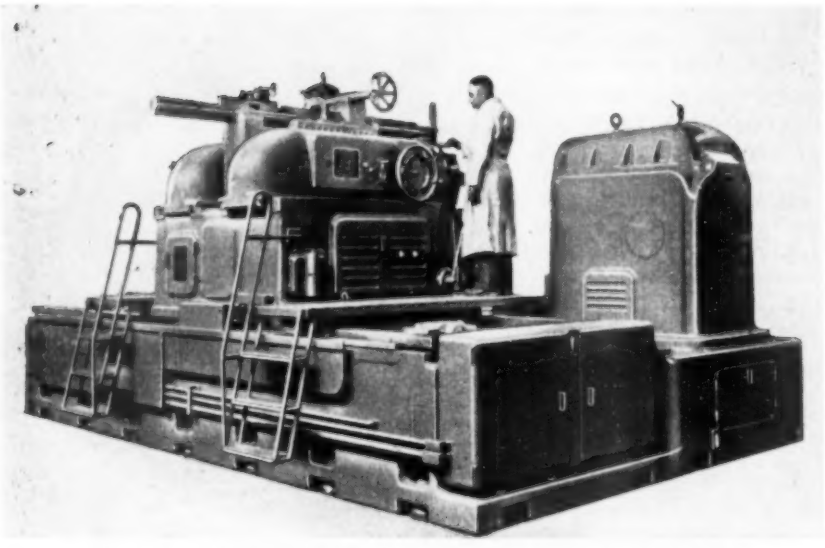
634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

NEW EQUIPMENT

T. M. REG. U. S. PAT. OFF.

• Materials + Processing •



Giant Gear Shaver With Maximum Shaving Range Up To 110"

UNIVERSAL CUTTER AND TOOL GRINDER (L97)

Capable of a wide range of grinding operations for manufacturing and reconditioning cutting tools, a new cutter and tool grinder has been developed by Covel Manufacturing Co.

Known as No. 12, this model is especially useful for reconditioning such tools as milling cutters, reamers, boring bars, and similar units, the maker states. A principal feature of the machine is that controls are designed for easy operation. The table and saddle are mounted on ball bearings mounted on hardened slides to allow free working and accurate travel. The main spindle is mounted in a quill for easy removal.

PRE-GROUND BORING TOOLS (L98)

Supplementing its line of solid round blanks, Kennametal, Inc., has introduced a line of solid round Kennametal tools already ground and ready for use in precision boring machines.

Designated as 275 R, the new tools have a slide cutting edge angle of 30° and an end cutting edge angle of 38° and are used primarily in a 30° boring bar. For use with a 45° boring bar, the 29SR group tools have corresponding angles of 45° and 53°. Sizes available in each style are 3/32", ⅛", 5/32", 3/16", and ¼". Tolerances are held to .000" and —.001" on the diameter, and .000" and .005" on all other dimensions.

LARGE CAPACITY GEAR SHAVER (L99)

A new giant gear shaving machine capable of shaving gears from 24" to 96" pitch diameter and up to 97" O.D. is announced by National Broach and Machine Co.

Said by the company to be the largest machine of its kind ever built, the shaver has a base of 20 ft. by 12 ft. 11" and is nearly 11 ft. high. With a maximum shaving range of 110½", it is especially well suited for production of large turbine reduction units and Diesel timing gears, according to the manufacturer.

An important feature cited by the maker is that characteristics of the gear may be checked without removing the work from the machine. The checking head is used to determine the size of work gear, amount of shaving stock, linear pitch, wobble, eccentricity, and pitch diameter. Gear alignment can be checked from either side of the machine.

INFORMATION FREE

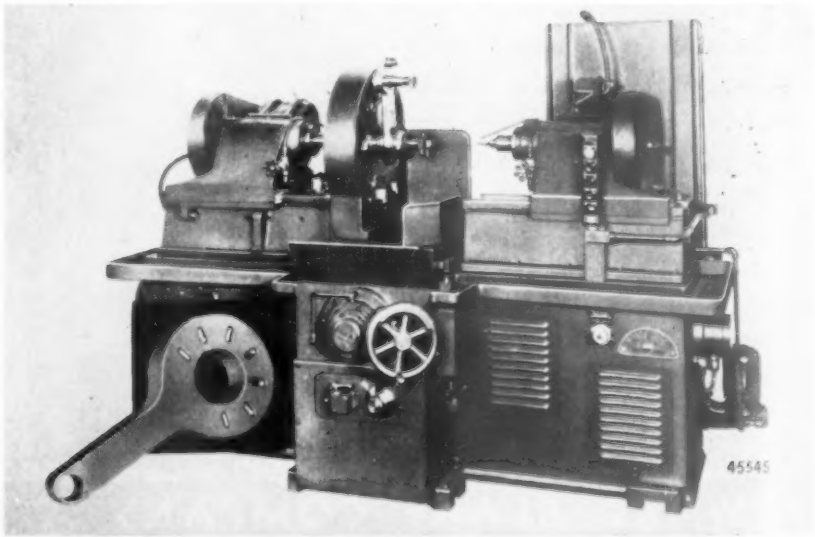
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 17..

HYDRAULIC SLOT CUTTER (M1)

Designed to cut two slots at one time, a new hydraulic, double-end spline milling machine has been developed by Snyder Tool and Engineering Co. Although built for use in the aircraft industry, the machine's operating principles lend themselves readily to appli-

(Continued on page 182)

Covel Universal Tool Grinder For Reconditioning Cutting Tools



New Snyder Milling Machine Cuts Two Slots Simultaneously

FREE INFORMATION and SERVICE

Request the information and service you desire and keep your library up-to-date . . .

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For your convenience these three business reply cards enable you to request quickly

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New catalogs — bulletins listed in this issue.

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Additional information or bulletins relative to new equipment — new materials or new processes.

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HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail.

Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described.

In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

USE THIS CARD

for requesting new catalogs and bulletins listed in this issue.

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USE THIS CARD

for requesting additional information or bulletins about new equipment, materials, processes, etc.

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Write in square, number of item describing one catalog wanted ➔ ☐

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USE THESE FREE REPLY CARDS

They are provided for your convenience in requesting information and service . . . . .

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DETROIT, MICH.

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NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

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THE BRAMSON PUBLISHING COMPANY
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Request for:
NEW CATALOGS
BULLETINS
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Request for additional information and catalogs covering
NEW EQUIPMENT
MATERIALS
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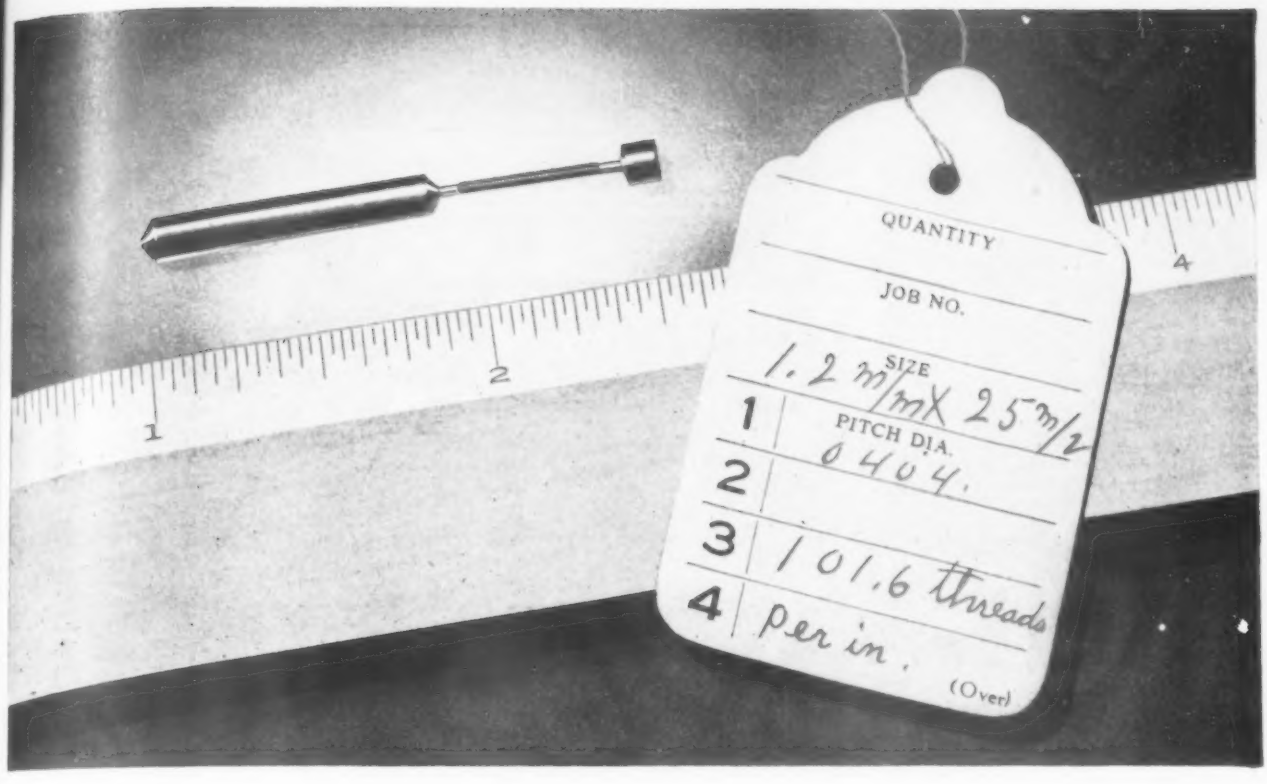
3

ANSWERING ADVERTISEMENTS
Requesting:
LITERATURE
REPRESENTATIVE TO CALL



101.6 threads per inch . . . chased on a Monarch Lathe!

If you're troubled with thread chasing on very small jobs like this one, take a lesson from this manufacturer and do them on a Monarch 10″ Precision Toolmaker's Lathe.

For this job, the gear train carries special gears for 101.6 threads per inch. The lathe is also equipped with Monarch's electric leadscrew reverse and rapid return. Threads are chased toward the headstock at 425 rpm., and with leadscrew reverse controls on the apron, the carriage is returned to the starting position at 1000 rpm., or faster if desired.

Thus, the thread chasing is done accurately, and valuable production time is saved by the young woman operator who does the job.

This example is just one of a wide variety of close tolerance work which can be done on Monarch 10″ Precision Toolmaker's Lathes. If you think you have jobs which these machines might do more quickly and accurately than by your present methods, we'll be glad to work with you.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY • OHIO

MONARCH LATHES
Save Time

cation in post-war production, according to the maker.

The part to be machined is clamped on a manually-operated indexing feature with seven stations. The two milling heads advance against hydraulically operated feed step screws and feed into the work by steps which are adjustable. When the cutters have reached full depth, they are allowed to dwell in the work for several reciprocations in order to produce a clean-cut slot.

VERTICAL TURRET (M2)

A new combination drilling and tapping vertical turret has been developed and introduced by Landau Machine Co. Features of the unit are three independent spindles and one tapping spindle built in the head.

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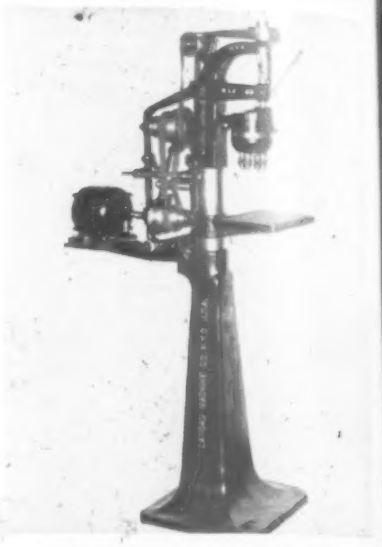
Any of the spindles can be brought into use instantly, according to the company, and a locking device is provided to allow continuous operation of the tapping spindle. Other features outlined by the maker are independent



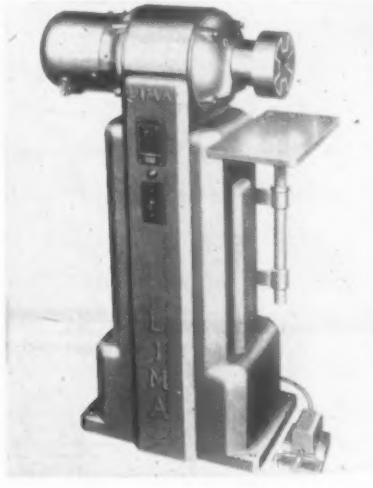
Drilling and Tapping Turret

depth adjustment on each spindle and quick-change speed construction which provides speed change without stopping the machine.

MAGNETIC POLISHING LATHE (M3)

Designed for speeding production by eliminating difficulties encountered in holding odd-shaped pieces or sections in conventional chucks or collets, a new magnetic polishing lathe has been introduced by Lima Electric Motor Co.

The lathe, which accommodates parts from 1½" diameter up, is especially suitable for highly-finished parts be-



Lima Magnetic Polisher

cause it leaves no chuck marks, according to the manufacturer. It is intended for use with steel and other ferrous metal shapes on polishing, burring, or lapping operations.

A foot pedal magnetizes the chuck, starts the motor, and demagnetizes the chuck when the operation is finished, allowing the operator to use both hands for manipulating the work.

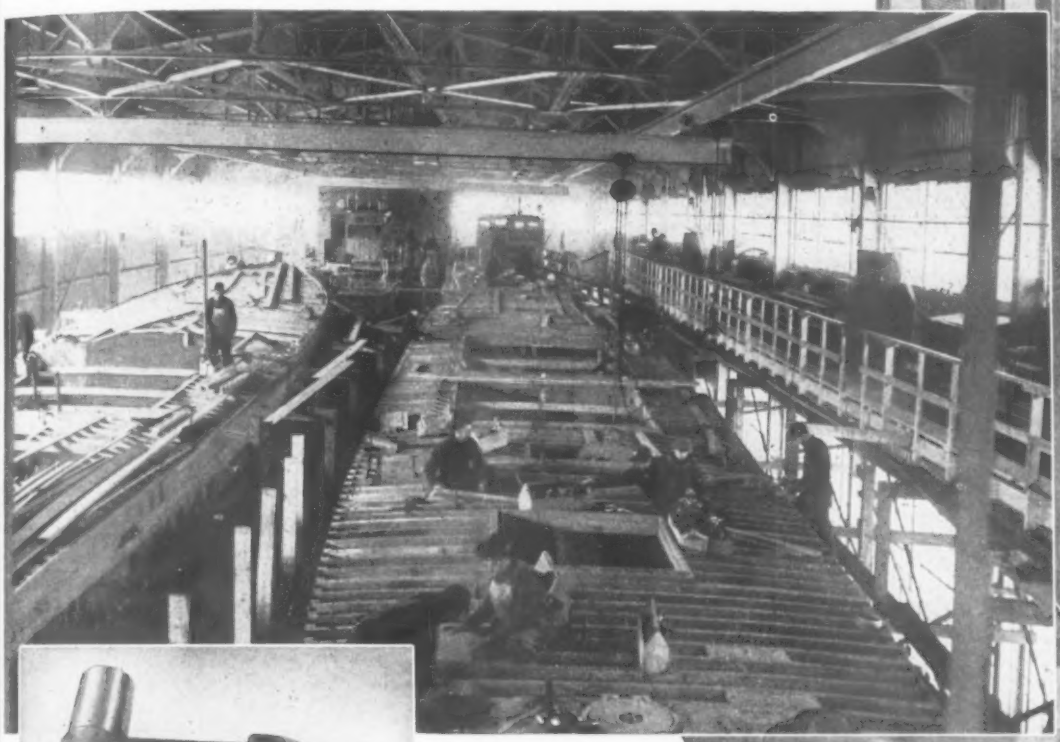
(Continued on page 184)

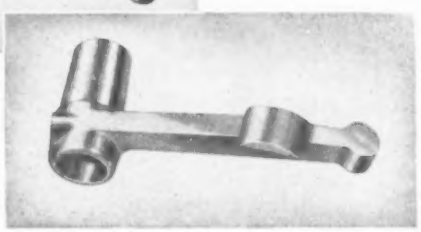
War Plane Specifications Require Torquing
Modern manufacturing methods call for controlled "settings" of vital nuts, screws, bolts, hydraulic fittings — of almost all threaded parts. Leading American aircraft and engine builders almost universally use the permanently accurate STURTEVANT TORQUE WRENCHES for innumerable applications ranging from building precision instruments to testing frictional drag in controls and motors. 50 models, capacities ranging from 0 to 5 inch pounds on up to 7200 inch pounds.
Write for catalog sheets.
Model F-100-I
(Capacity 0-100 in. lbs.)
Illustrated
P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

LINES BEHIND THE LINES

CONVERTED FROM PLEASURE CRAFT TO P-T's AND S-C's, THE BOATING INDUSTRY BUILDS AT TOP SPEED FOR VICTORY!

Keeping pace with the Kaisers and other miracle workers in the shipyards, the small boat builders are placing the emphasis decidedly on speed. Yet the highly efficient machinery in the boats they are building also puts a premium on accurate parts fitting. To secure this production-with-precision the boating industry relies heavily on broaching. Broaching—a better way to do many metal working jobs — is the only *right* way to do some!





Using an American Type T Three-Way Broaching Machine, top and bottom faces are finished on the rocker arm shown in before and after views above. Many marine products — including parts for motors, transmissions, armament, and electrical systems—are broached economically with American equipment. American's *complete* broaching service — machines, tools, and engineering — makes war production more efficient, post-war production more profitable.

BROACHING IS BETTER THE *American* WAY

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

TAP EXTRACTOR RECONDITIONING SERVICE (M4)

Walton Company has announced a new free reconditioning service available to users of its tap extractors. Broken holders, collars and sleeves will be replaced free if mailed to the company. Steel fingers are not included in the free service because they are often subjected to unusually severe strains, but are available if needed. The company offers 48-hour service on extractors sent in for reconditioning and replacement of parts.

INFORMATION FREE

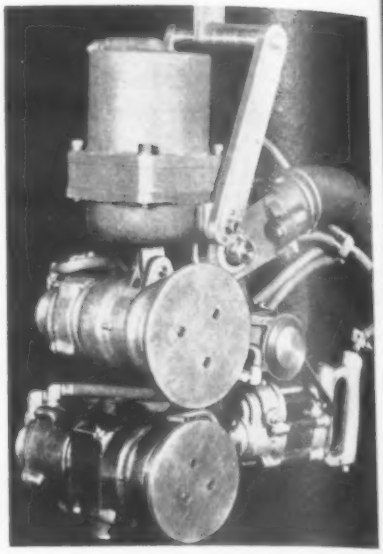
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

PORTABLE PNEUMATIC SEAM WELDING GUN (M5)

Intended for use in seam welding large assemblies mounted in stationary fixtures and parts too big to be moved to the welder, a new air-operated portable welding gun is being manufactured by Progressive Welder Co.

The machine will weld steel up to two thicknesses of 20 gage, including stainless steel. The gun is suspended in such a manner that it can be swiveled in any direction, horizontally or vertically.

Features of the welder include a head



Air-Operated Seam Welder

operated by 2 h.p. air motor; welding speed of between 48" and 52" per minute; maximum pressure of 1400 lbs. per sq. in. with 90 lbs. line pressure; water-cooled transformer, cable, jumper, and bushings; and plastic insulating washers to prevent shorting of the rolls.

GENERAL PURPOSE MARKING MACHINE (M6)

Jas. H. Matthews & Co. has announced a new marking machine designed for use on almost any round or flat product.

Available with either a motorized unit or a pneumatic attachment, the machine is used for machining part numbers, patent numbers, names, codings, trade marks, and similar imprints on a wide range of shapes and sizes up to 6" in diameter or thickness, according to the manufacturer. For flat work,

(Continued on page 186)

Matthews Marking Machine

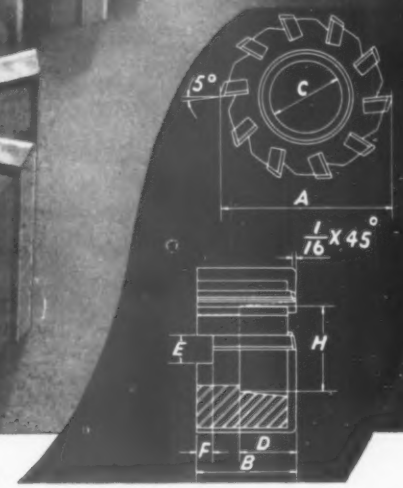
The Diamond Grip
Stops the Slip
HOW TO GET
MORE WORK
from your
OLD
MACHINES
Get a Sutton Master Collet and a Master Feeder for each automatic. We'll recommend an assortment of interchangeable, replaceable pads that will handle all your work—round, hex or square—up to machine capacity.
Sutton full-floating Collets eliminate trouble with hot-rolled stock. Sutton patented Diamond Grip Collets cost no more than ordinary collets, but enable you to speed up machine cycles to the capacity of the tools. Sutton Draw-bars and Adaptors enable your old lathes to handle full length bar stock.
SUTTON TOOL COMPANY
2895 W. GRAND BLVD., DETROIT, MICHIGAN
See our representative or send for Catalog 15.
SUTTON
Diamond Grip
COLLETS

The New Tool

FOR FASTER MILLING • MORE PIECES PER GRIND
FINER FINISH • REDUCED COST

TANTUNG SHELL END MILLS

PRODUCTION GOES UP WITH THE USE OF
TANTUNG *"THE MIRACLE METAL"*



TANTUNG SHELL END MILLS WITH BRAZED BLADES

DIMENSIONS OF TANTUNG SHELL END MILLS							No. of Teeth	Size of Tips
A	B	C	D	E	F	H		
2	1⅜	.750	⅝	.322	3/16	1 1/16	8	3/16 x ⅜ x 1⅜
2½	1⅝	1.000	⅞	.385	7/32	1⅜	10	3/16 x ½ x 1⅝
3	1¾	1.250	1.	.510	9/32	1 21/32	10	¼ x ½ x 1¾
3½	1⅞	1.250	1⅛	.510	9/32	1¾	12	¼ x ⅝ x 1⅞
4	2¼	1.500	1¼	.635	⅜	2¼	12	¼ x ⅝ x 2¼

The Tantung Shell End Mills listed above are standard right hand cut and are held to standard tolerances. These shell end mills are designed for faster milling and will produce more pieces per grind. The keen, durable cutting edge guarantees finer finish on work.

QUOTATIONS WILL BE FURNISHED ON REQUEST

4332

Ramet

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS — DISTRICT SALES & SERVICE IN PRINCIPAL CITIES

solid roller dies or mortise roller dies and interchangeable segment type are used. Round parts are marked with flat dies or interchangeable steel type. The top of the machine is flat to allow convenient placement of a type box, lock wrench, and similar equipment.

HOLLOW SPINDLE LATHE *(M7)*

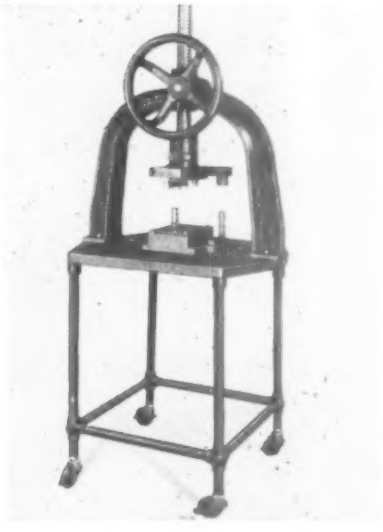
Lehmann Machine Co. announces that the latest addition to its line of "Hydratol" large hollow spindle lathes is an 18" model with 7⅛" hole in the spindle. A complete line of hollow spindle lathes now is available in sizes from 18" to 36", according to the company.

"Hydratol" Lathe

PORTABLE DIE-SET *(M8)*

Designed to enable die-makers to complete die-sets at the bench and to assure fast and accurate punch-to-die alignment, a new portable die-set machine is being offered by Mo[illegible] Special Tool Co., Inc.

With the die shoe clamped to the table and the punch-holder fixed in position in the ram, the punch may be removed any number of times without disturbing the alignment, the company states. The unit is easily transportable on casters and may be moved with the shoe in place. The operator need use only one hand to operate the unit. The machine also may be used for shearing in certain type punches.



Die-Setting Machine

Tannewitz VARIABLE SPEED BAND SAWS Are Metal-Cutting EXPEDITERS!

Removing gates and risers from steel, cast iron, manganese bronze, hard and soft brass, aluminum and magnesium castings, as well as many other metal cutting jobs, are handled with great dispatch and surprising savings on TANNEWITZ VARIABLE SPEED BAND SAWS. And since they are available in any 3:1 speed ratio from 100:300 to 1000:3000 blade feet per minute, with instant adjustment to intermediate speeds, one machine serves ideally for cutting a variety of materials. Made with 30", 36" and 42" wheels.

Other models (single speed) for such purposes as sawing large blocks of aluminum and magnesium, cutting large steel templates etc., are available in capacities and speeds to ideally accomodate work of practically any size or character. For complete facts write for bulletin on Variable Speed Band Saws. Also on request bulletins on: Sheet Metal Cutting Band Saws; DI-SAWS, combination band saws for sawing, filing, polishing.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

NEW PRECISION MEASURING INSTRUMENT *(M9)*

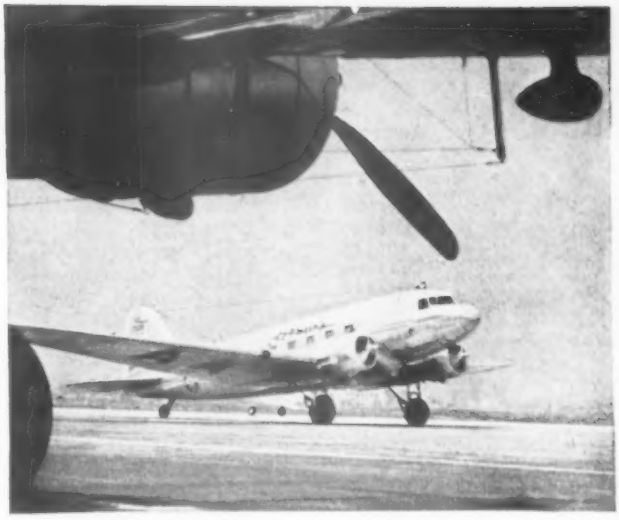
Internal and external dimensions held to extremely close tolerances can be measured on a new precision measuring instrument developed by Sheffield Corporation.

The machine can be used for checking master and working ring gages, for

(Continued on page 188)

Sheffield Measuring Instrument

All of American's Prints Are Ozalid Whiteprints



At American Airlines they speak of "the *whiteprint* of things to come." Here . . . print production is one hundred percent Ozalid—no blueprints.

They're making Ozalid whiteprints of their engineering and isometric drawings, weather reports, flight analyses, and office forms.

What's most important, they're saving time, labor, and materials.

WILL OZALID HELP YOU ALSO?

If your drafting output has reached the point where it would be more economical to do your own printmaking . . . by all means investigate the savings possible with an Ozalid whiteprint machine.

If you have already installed expensive blueprinting equipment . . . you can add a Dry Developing unit, which when used with your present Printer, will provide all the advantages of Ozalid printmaking.

ONLY OZALID GIVES YOU THIS VERSATILITY

With Ozalid you're not limited to one-color reproductions. You can make prints having blue, black, or maroon lines on a white background. This allows you to assign identifying colors to different departments, to distinguish checked from unchecked prints, etc.

With Ozalid you can use cut sheets as well as roll stock. By ordering sheets cut to the size of your tracings, you can completely eliminate trimming waste.

With Ozalid you can use a wide selection of foils and transparent materials—an impossibility with other methods. You can employ these to reclaim the details of soiled or worn tracings . . . to make composite prints . . . and duplicate originals to be used instead of the original tracings in subsequent print production.

All Ozalid Prints are produced in the same manner. Dry Development eliminates variations in production.

These Ozalid features will give you a "head start" in production.

PHOTOGRAPHS—COURTESY OF AMERICAN AIRLINES

1 An Ozalid machine is clean, compact, and may be installed in a corner of the drafting room. Any inexperienced person can operate it. ALL prints are produced in the *same* continuous operation which incorporates *Exposure* and *Dry Development*.

No baths, driers, or plumbing connections.

2 When making design changes, it's never necessary for the draftsman to redraw any lines which remain the same. Ozalid saves valuable time. Make a "duplicate original" of the tracing. Then, delete the obsolete sections with Ozalid Correction Fluid — and draw in the new design. It's that easy!

3 Ozalid whiteprints of engineering and isometric drawings enable even inexperienced workers to grasp production details quickly. They are easier to read and check than blueprints and are preferred in the shop and field. Pencil or ink notations can be recognized immediately.

WRITE FOR CATALOG AND SAMPLES OF OZALID WHITEPRINTS

OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORPORATION

JOHNSON CITY, N. Y.

OZALID IN CANADA—HUGHES OWENS CO., LTD., MONTREAL

P.S. Some More Ozalid Users:

1. Pratt & Whitney Aircraft Division
2. United States Rubber Company
3. Bethlehem Steel Company
4. Emerson Radio & Phonograph Corp.
5. Ford Motor Company
6. Cramp Shipbuilding Company
7. International Business Machines Corp.
8. Edward G. Budd Manufacturing Co.
9. North American Aviation, Inc.
10. Boeing Aircraft Company

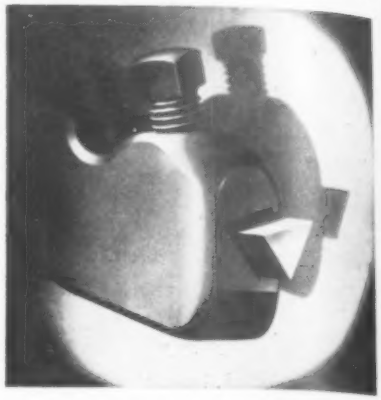
setting snap and length gages, and for similar precision work on internal dimensions. The instrument also will check open holes to a depth of 3" from one side and an additional 3" from the other side, will discover taper, bell-mouth, and out-of-round conditions, and will check diameters and other internal dimensions from ¾" to 12".

When used on external work, the machine will check rounds, straights, and tapers within a maximum dimension of 12".

TRIANGULAR BIT CUTTING TOOL (M10)

Savings of up to 50 per cent in high speed tool steel and from three to ten times longer life are claimed by Triangle Tool Co. for its new type cutting tools which feature triangular shaped bits set in a tool holder.

Vibration and chatter in the holder are virtually eliminated by a triangular seat in the holder, according to the maker, permitting greatly increased machine speeds and reducing tool wear. Bits are chromium plated. Right and



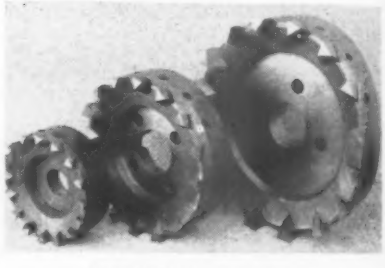
Triangular Cutting Tool

left hand cutting is performed with the same bit without additional grinding and bits can be turned end-for-end for square cutting operations without any extra adjustment required.

NEW TYPE MILLING CUTTER (M11)

Weddell Tools, Inc., has introduced a new line of face milling cutters using a new type of cutter blade, known as Tri-Bits.

The cutting blade is a triangular shaped adjustable tool bit securely locked by a single screw in a V-shaped hole in a heat-treated cutter body. Since



Tri-Bit Milling Cutters

the body is tied together all around the blade, there are no slots to spring or tear open, according to the manufacturer. Minute adjustment of the cutter blade up to 60 per cent of its length is possible.

Because of the triangular shape of the cutter and the dished face of the body, chip clearance is greatly increased, the company states. No wedges are used and no hammers or drifts are necessary to maintain the cutter.

SELF INDEXING LATHE ATTACHMENT (M12)

Kessler Aero Tool Co. has introduced a new self-indexing bed-turret with six tool stations and six individual stops indexing with the turret.

An important feature cited by the manufacturer for the lathe attachment is that back-indexing by hand to speed production is possible when using less than a full set of six tools. Also, it is claimed that because index bushings and lock pins are of hardened and ground tool steel, accurate precision repeating is assured.

(Continued on page 190)

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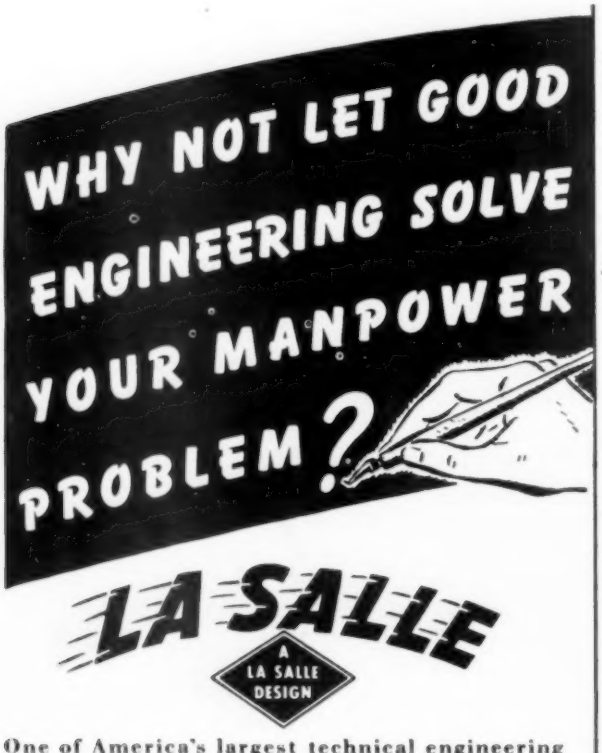

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MANAGEMENT ENGINEERING

★ Tool Designing ★ Plant Layout and Routing
★ Process Engineering ★ Product Engineering
★ Designing of Jigs, Tools, Fixtures, Gauges, Dies and Special Machines.

LaSALLE DESIGNING COMPANY

AL J. CONN, Managing Director

628 West Lake Street, Chicago

LA SALLE

Serves Many of America's Famous Manufacturers

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AMERTORP CORP.
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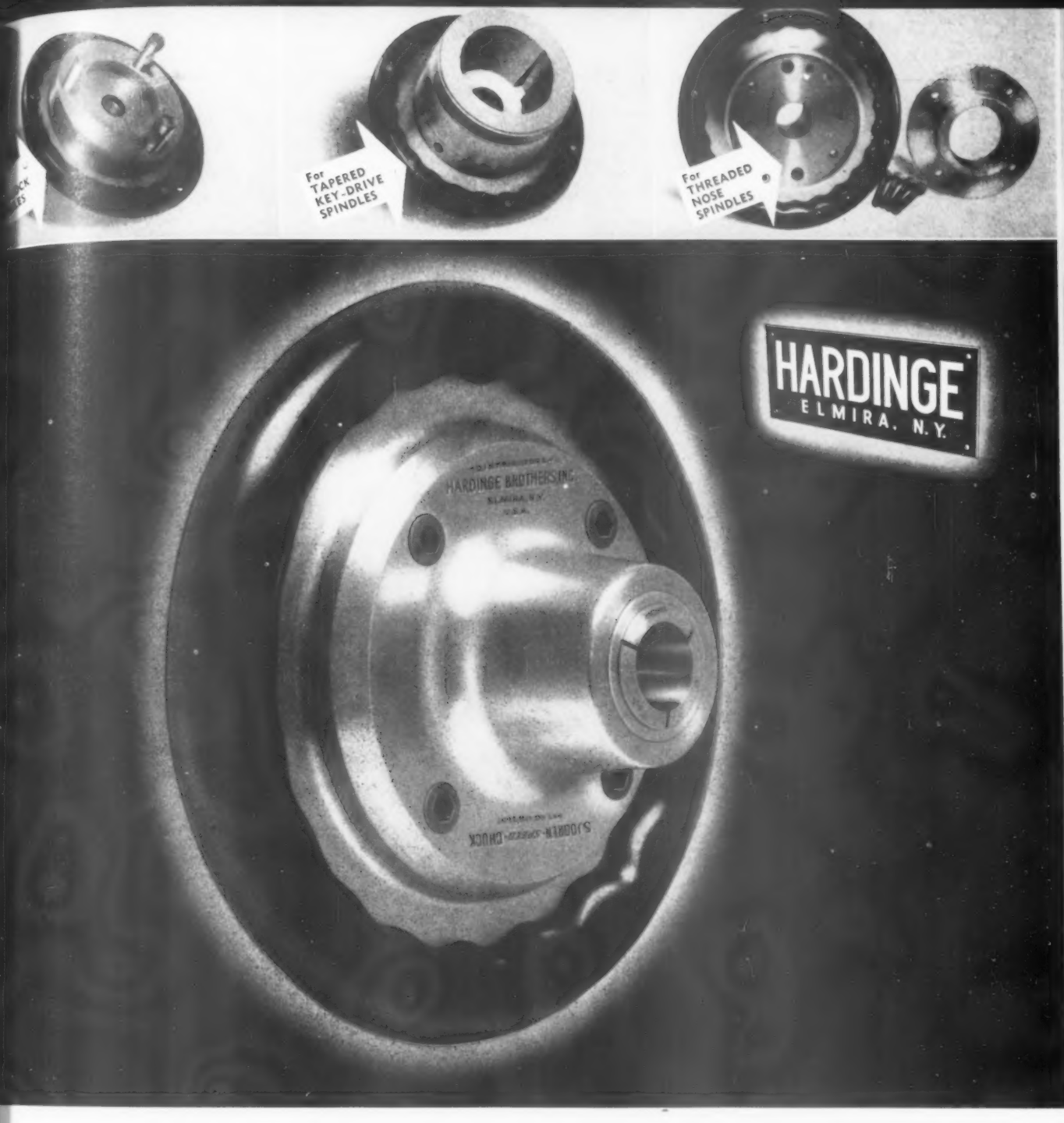
BELL AIRCRAFT
BOEING
J. I. CASE CO.
CONTINENTAL MOTORS
CRANE
CURTISS-WRIGHT
DOUGLAS AIRCRAFT
ELECTRIC AUTO-LITE
ELGIN WATCH
EMERSON ELECTRIC
FAIRCHILD AIRCRAFT
KOHLER COMPANY
LOCKHEED AIRCRAFT
MINNEAPOLIS-HONEYWELL
NASH-KELVINATOR
NORTH AMERICAN AVIATION
NORTHROP AIRCRAFT
PRATT & WHITNEY
R. C. A. MFG. CO.
STEWART-WARNER CORP.
VEGA AIRCRAFT
ZENITH RADIO CORP.



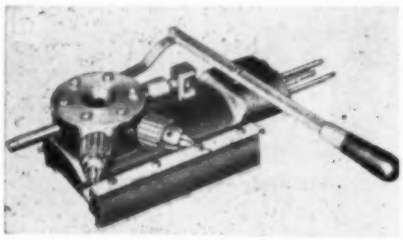
HARDINGE-SJOGREN *SPEED* COLLET CHUCKS

A HARDINGE-SJOGREN Nose Type Speed Collet Chuck enables you to get full value from your investment in tool-room lathes, engine lathes and milling machines. It gives greater capacity, saves time, increases accuracy and assures better results.

The amazingly fast action of the HARDINGE-SJOGREN Speed Collet Chuck gives it full right to its name. An almost effortless turn of the handwheel, one way or the other, automatically opens or closes the collet, releasing or gripping the work as desired. Its grip is adjustable and sure.

Available in three sizes: 1", 1⅜" and 1¾" capacity

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



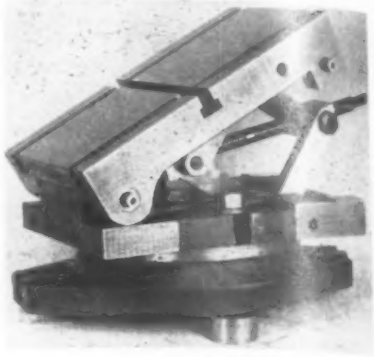
Six-Station Indexer

The turret head is mounted on a preloaded bearing. The attachment, lever-operated for rapid action, has a 4" maximum stroke, a minimum index stroke of 1½", and a total travel of 5½". The turret is shipped assembled except for holes for attachment, which are left to be bored for perfect fit on the individual machine.

NEW PRODUCTO ANGLE PLATE *(M13)*

Producto Machine Co. announces a new angle plate employing an elevating screw for accurate positioning in mounting work up to a 45° angle.

The plate provides a quick and accurate means of locating work to correct angle for operations on boring mills, milling machines, drill presses and similar machinery, the company states. Three sizes are available ranging from 9" by 7" to 24" by 18".



New Angle Plate

Producto also has recently introduced a new precision tool room vise and a new quick lock angle vise.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 171.

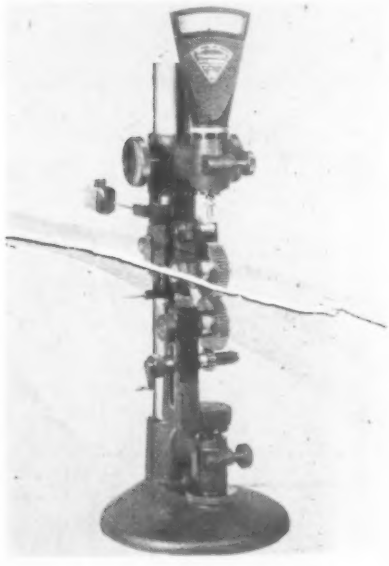
GEAR TESTER *(M14)*

Developed for detecting and locating gear faults during the manufacturing process and checking accuracy on the finished product, a new gear tester has been introduced by George Scherr Co.

Known as the Comparitol, the tester may be used to check eccentricity, variation in tooth thickness, errors in spacing, poor rolling action due to involute errors, off center teeth, and many other common gear faults. It also may be employed to check gear train assembly and to show up rolling section between two working gears or gear and pinion.

Test gears are checked against a master gear, known to be accurate. Any divergence or error is readily indicated in the comparator head which gives

(Continued on page 192)



Comparitol Gear Tester

CIRCLE "R"
Metal Cutting Saws
MADE BY PERFECTIONISTS
TRADE
R
MARK
Also Combination Drills and Countersinks and Reamers
Grinding hubs on automatic machines. An exacting operation. Tolerance .00025".
CIRCULAR TOOL CO., Inc.
PROVIDENCE, R. I.
CHICAGO • PHILADELPHIA • NEW YORK • DAYTON • CLEVELAND
SYRACUSE • INDIANAPOLIS • DETROIT • ST. LOUIS

We're in the Service of TOOL Protection

Shoulder to shoulder — on the Home Front — we're all fighting to protect the American Way of Life.

By day and by night the Tool Commandos for the Eastern Cutter Corporation make further raids into enemy territory, producing new tools from used tools, converting standard tools to special tools for special jobs, sharpening worn tools, and solving a host of other tool problems for thousands of essential war industries which are striving to increase production for a *speedy Victory*.

These are only a few of the many *Victory Services* that are helping to reduce tool costs and save critical steel.

TOOLS FOR VICTORY!

Why not call on us to give you some of our 30 years of tool experience? There is no obligation.

A COMPLETE RECONDITIONING SERVICE FOR TOOLS

NEW MILLING CUTTERS FROM OUR STOCK OR YOUR OWN STANDARD CUTTERS CAN BE QUICKLY CONVERTED TO SPECIAL CUTTERS

EASTERN CUTTER CORPORATION 30-32 Littleton Ave., Newark, N. J.

Chrome Plant **MASTER CHROME SERVICE** INC., 5709 Herman Ave., N. W., Cleveland, Ohio

readings to .001", .0005", .0025", or .0001", depending on the class of work and the precision required.

LARGE DIAMETER BENDING MACHINE (M15)

Developed especially for forming greater diameters than is possible with smaller models, a new bender, known as Di-Acro No. 3, has been placed on the market by O'Neil-Irwin Mfg. Co.

Incorporating all the features of the company's smaller models, the new unit is heavier and of more rugged construction and has a capacity of ½" round cold-rolled steel bars, formed cold to 1" radii or larger.

Di-Acro Bender

Other features listed for the machine are two-way action, automatic and reversible forming nose, operating leverage of from 35" to 80", and 12 right or left hand operating positions for either bench or pedestal mounting.

DOUBLE CHUCK SPEED LATHE (M16)

Double-end construction to allow two operators to work at the same time, thus utilizing floor space efficiently, is a principal feature cited by Standard Electrical Tool Co. for its new speed lathe.

Each chuck may be controlled independently through a combination clutch and brake which permits individual operation of either working unit. The machine also is available in a single-end pedestal model or in a bench model with foot pedal control.

Double-End Speed Lathe

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

NEW LIGHT WEIGHT PNEUMATIC DRILL (M17)

Particularly well suited for use by women workers because of its light weight, a new pneumatic drill with an all-plastic housing is offered by Aro Equipment Corp.

(Continued on page 194)

Small Air Drill

KEEP it coming . . .

by CAREFUL MAINTENANCE

THERE is really no need for us to emphasize the part that chucks play in war production. But there is a need for us . . . and for you . . . to urge every machine tool operator, and especially those who are not "old hands", to take excellent care of chucking equipment these days. A great deal of precious skilled labor and a lot of critical material goes into the manufacture of a Cushman Chuck. As it comes into your shop, it is a fine precision tool with a long potential service life. But it needs periodical lubrication. It should be kept clean and the precision bearing surfaces free from abrasive particles. It must be accurately and carefully mounted on its spindle. And it should not be overloaded. Chucks are tools and tools are weapons . . . treat 'em right.

* * * * *

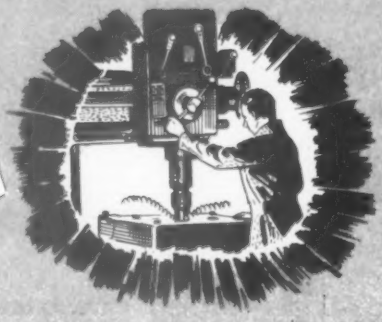
To help you, we can supply convenient CHUCK-CHECK maintenance cards to be given to your operators. Just let us know how many you need. The Cushman Chuck Company, Hartford 1, Conn.

CUSHMAN

A World Standard for PRECISION

Ship worn-out High Speed Tools back to the steel mills . . . this high grade steel can do another war job.

EQUIP YOUR MACHINES *with high quality cutting tools*



—that's the way to get accurate, dependable work under the heaviest production schedules.

MORSE

THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

Weighing only 1 lb. 12 oz., the drill has ample power for a wide range of small tool production jobs, according to the maker. It operates at 2500 rpm. and takes ⅛", 3/16", ½", or 5/16" bits with Jacobs chucks.

Overall length is 6¼". Other features are a non-slip grip, full ball bearing construction, and a built-in, visible oiler.

CONTOUR DUPLICATOR *(M18)*

Known as the "Dupligraph", a new device has been perfected by Inter-Lakes Engineering Co. for transferring on paper the exact contour of irregular objects, such as propeller blades. The instrument also will transcribe the contour directly on metal.

According to the company, the contour of irregular objects can be determined in a fraction of the time required by the method of cutting and fitting wood templates. The instrument is particularly useful for concave readings in forming dies where ordinary templates can not be used and in obtaining a true reading of a stamping, showing the amount of spring-back and warp.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

Duplicating Machine

GEAR MARKING SAFETY HOLDER *(M19)*

A new safety hand model gear marking holder, reported to have reduced stamping costs for one manufacturer between 25% and 50%, has been introduced by M. E. Cunningham Co.

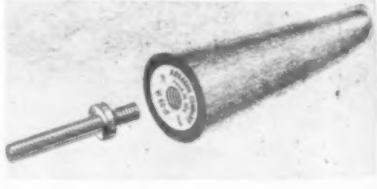
Straight type instead of tapered characters is used in the plate which utilizes a special holder to prevent the type from flying or falling out. Positioning of the letters is provided by a pilot, designed to fit the gear hub. According to the manufacturer, use of special safety steel in the holder assures maximum service and safety by eliminating mushrooming and spalling.

Gear Marker

DEMOUNTABLE ABRASIVE WHEEL *(M20)*

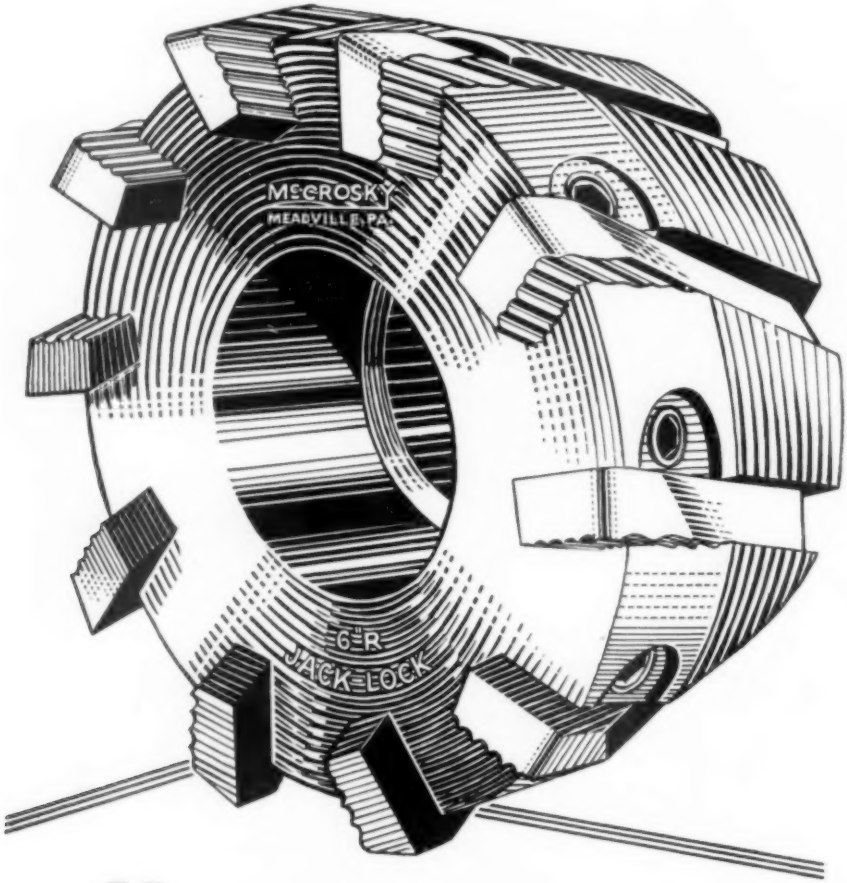
Abrasive Company has developed a new line of abrasive mounted wheels and points with demountable spindles which can be removed when the grinding surface is no longer usable.

Known as Victory Points, the new product consists of a threaded porcelain bushing inserted in and fused to



Demountable Abrasive Point

(Continued on page 196)



McCROSKY offers a brand-new manual for users of McCrosky JACK-LOCK Milling Cutters. Covered in the 24-page illustrated booklet are cutter mounting, adjustment and grinding, speeds and feeds, the action of cutting fluids, and other topics dealing with maintenance and general care of inserted-blade milling cutters.

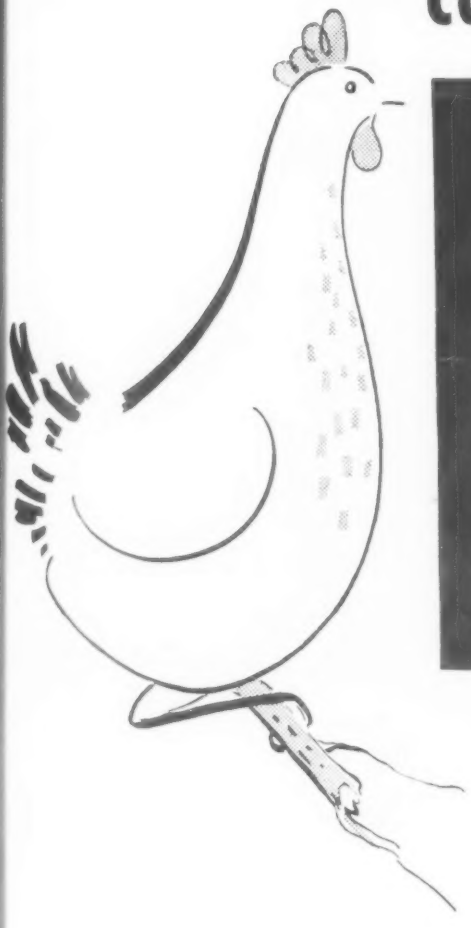
Although the McCrosky Milling Cutter Manual is prepared especially for users of JACK-LOCK Cutters, much of the information is fundamental and can be used to advantage with all types of milling cutters.

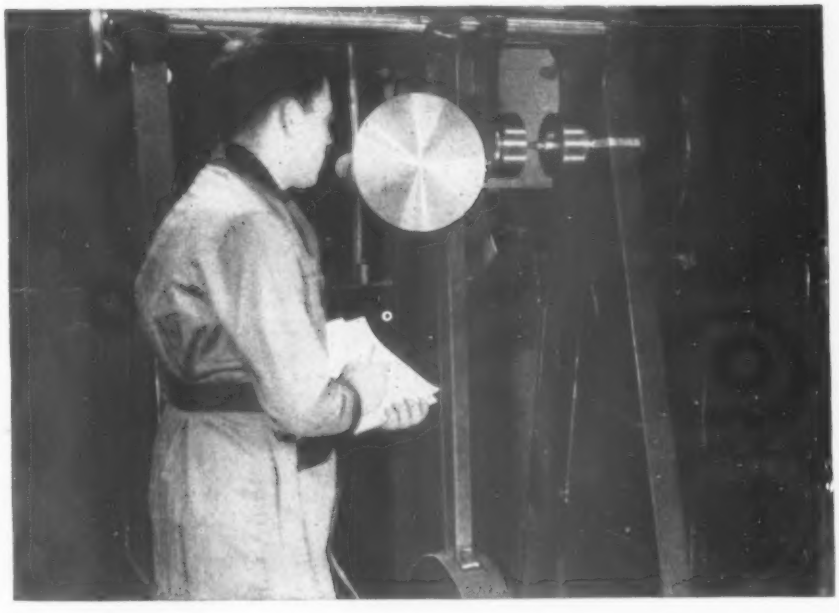
For your free copy write to McCrosky, Meadville, Pa.

COST CUTTING TOOLS

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

No "chicken-necked" SOCKET SCREW can survive this Twist...





Brutal overloads applied in Torque Test make sure P-K Socket Screws will more than meet setting-up stresses . . .

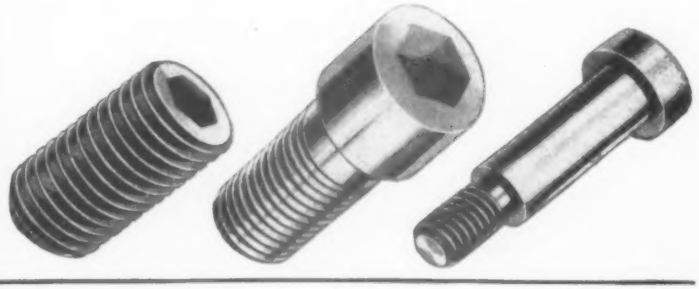
To make sure you get no "chicken-necks" among Parker-Kalon Socket Screws, thorough tests are made in the P-K Laboratory with this steel-muscled twister that develops torsional stresses far beyond normal. For example, a P-K ½"-20 (N.F.) Cap Screw must withstand a 2200 inch-pound minimum load. These tests make sure that any P-K Socket Screw can be set up as tight as required without danger of the head twisting off.

The torque test is only one of 16 check-ups made to assure the unfailing performance of P-K Cold-forged Socket Screws. This rigid routine of *quality control* eliminates the "doubtful Screws" – screws that *look* all right, but some of which fail to *work right*. Socket Screw users need this protection today more than ever. Specify "Parker-Kalon" next time you order . . . it costs no more. Parker-Kalon Corp., 190-198 Varick St., New York 14.

This 16-point "Quality-Control" protects P-K Socket Screw Users

1–Chemical Analysis. 2–Tensile Strength. 3–Ductility. 4–Torsional Strength. 5–Ability to take Shock Loads under Tension. 6–Resistance to Shock Loads under Shear. 7–Hardness. In addition, there is a rigid inspection of these essentials: 8–Head Diameter. 9–Head Height. 10–Concentricity of Head to Body. 11–Socket Shape. 12–Socket Size. 13–Socket Depth. 14–Centricality of Socket. 15–Class 3 Fit Threads. 16–Clean Starting Threads.

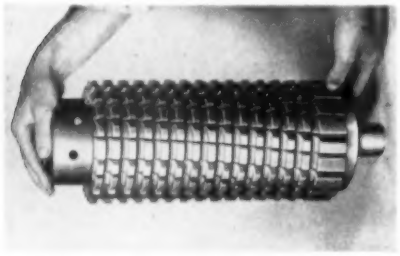
PARKER-KALON
Quality-Controlled
SOCKET SCREWS



the abrasive wheel mass at high temperature. The demountable spindle screws into the bushing and forms a tight fit that will not allow the spindle to break off, pull out, or twist. It can be unscrewed easily and a new point or wheel installed in a few seconds, according to the maker. The spindle need not be removed from the grinder or chuck head during the process.

MULTIPLE THREAD MILLING CUTTER (M21)

Plan-O-Mill Corporation has developed a large multiple thread milling cutter capable of threading internal and



Plan-O-Mill Milling Cutter

external threaded parts up to 16" in diameter.

The cutter, which is 12¾" long and 6½" in diameter, also provides the Higbee cut, which removes the imperfect thread at the same time the thread is milled. By segmenting the cutter, company engineers solved the difficulty of obtaining necessary hardness in so large a cutter and also provided a spiral gash cutting action for smoother mill-

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

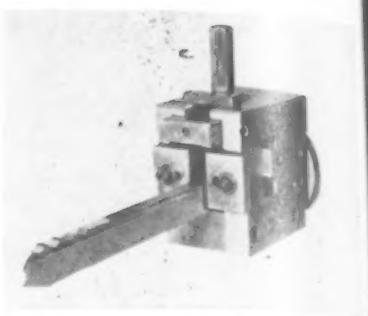
ing and improved finish, according to the manufacturer. Lower cost and easier resharpening also are advantages attributed to this design.

KEYWAY BROACH PULL HEAD (M22)

Reduced broach breakage, elimination of various size threaded pullers, considerable savings in time, and reduced hazard to the operator are features cited by American Broach and Machine Co. for its new keyway broach pull head.

Although designed primarily for pulling keyway broaches of virtually all sizes, the head can also be used to pull broaches of rectangular oval, or other shape. It can be operated manually or automatically. Since it is necessary only to slide the broach into the pull head instead of screwing it in, the operators hands need not come in contact with the sharp edge of the tool.

The head holds the broach in alignment against flat surfaces and is equipped with adjustable centering gates to eliminate side movement of the



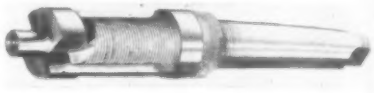
Broach Puller

broach. It is not necessary to discard threaded shank broaching tools when using this puller, since an adapter is available for holding threaded shanks.

SPOT FACER AND COUNTERBORE (M23)

A new spot facer and counterboring tool with removable cutter has been introduced by J. M. Nash Co. According to the manufacturer, the cutter is removed for sharpening by simply loosening a knurled nut and cone nut and slipping the cutter back out of the bar. After the tool is re-sharpened, it is re-

(Continued on page 198)



Spot Facing Tool

NATIONAL Tools CLEVELAND

Postwar Plans Complete

National Tool is Prepared for Peace— its equipment requires no conversion

ARMY E NAVY

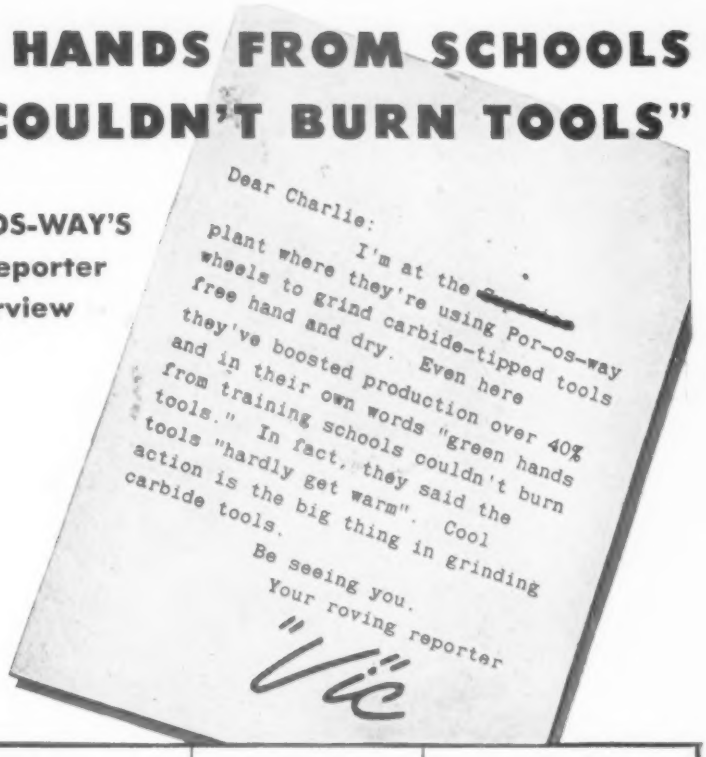
NATIONAL TOOLS HAVE AN INTERNATIONAL REPUTATION

The NATIONAL TOOL Co.

11200 MADISON AVENUE . CLEVELAND, OHIO

"GREEN HANDS FROM SCHOOLS COULDN'T BURN TOOLS"

Quotes POR-OS-WAY'S War Plant Reporter from Interview



Dear Charlie:

I'm at the [redacted] plant where they're using Por-os-way wheels to grind carbide-tipped tools free hand and dry. Even here they've boosted production over 40% and in their own words "green hands from training schools couldn't burn tools." In fact, they said the tools "hardly get warm". Cool action is the big thing in grinding carbide tools.

Be seeing you.

Your roving reporter

"Vic"

THE JOB: Grinding free hand and dry on Excello Tool Grinder carbide-tipped tools 1" x 1" x 6", for turning airplane struts, shaping airplane carburetors, shaping and turning gun turrets for planes.

THE WHEEL: Por-os-way 10" x 2" x 2" C54KV3

All facts and figures given are taken from an actual field survey made by a Por-os-way correspondent

THE RECORD	POR-OS-WAY WHEEL	FORMER WHEEL
Number tools per hour per man	37	26
Number of dressings required	NONE	Every 2 hours
Pieces per wheel	888	520
Stock to be removed	.000"—.250"	same
Wheel life	24 hours	20 hours
Depth of cut	.002"—.010"	Tools burned when jammed into wheel
Number of passes required	12	48
Amount of rejects	0	50 per day (scrapped)
Increase in production	42.3%	

SOUTH O TEAR

WRITE, *for complete booklet "Facts About Por-os-way". The address is 464 Wheatland Street, Phoenixville, Pennsylvania.*

2 TO 5 TIMES MORE WAR PRODUCTION PER MAN PER MACHINE

POR-OS-WAY*

a new RADIAC* PRODUCT

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to VALLEY FORGE

*T. M. Reg. U. S. Pat. Off.

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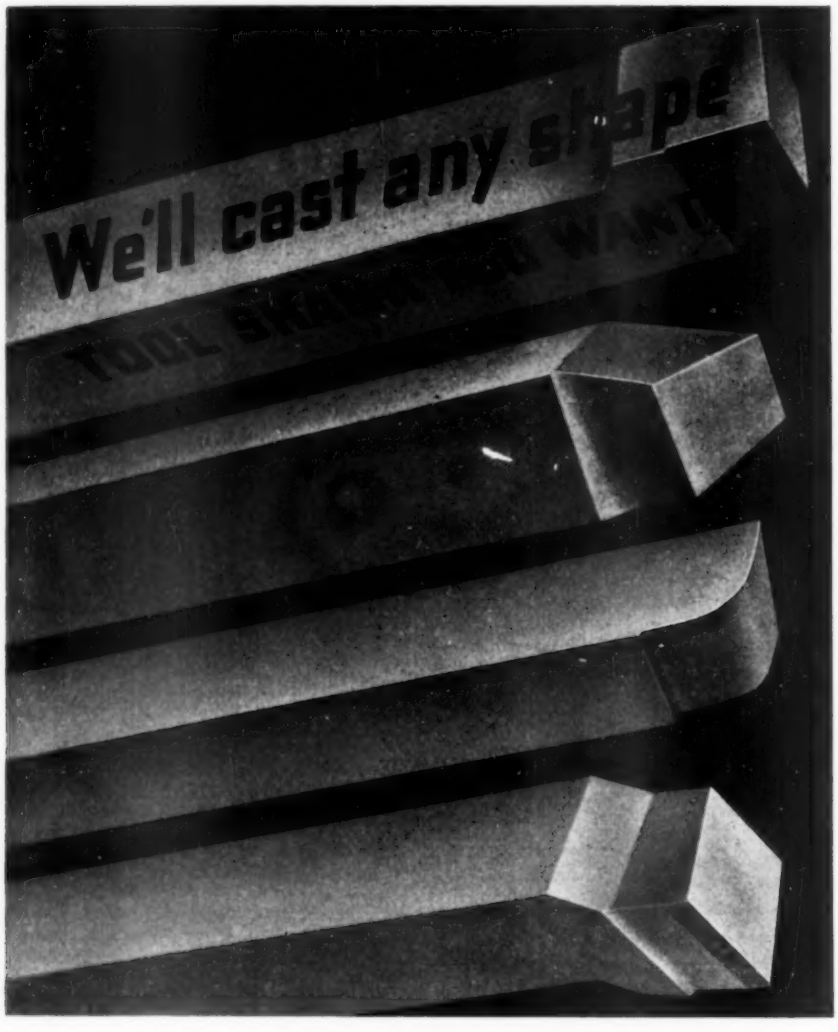


In addition to our popular line of standard-shape Victory Tool Shanks, cast of tough Meehanite, we are supplying many metal working plants with special shapes.

We have found this Meehanite Metal suitable for such things as boring heads and bars, dies, forming tools, milling cutter heads, crankshafts—in fact, any application where high tensile castings are required. As large users of castings in our own engine products, we have excellent facilities for designing, producing and machining quality castings.

Send us a sketch of any special shapes you use, and we'll be glad to quote on patterns and castings to your specifications. You'll be surprised at the moderate cost.

Cooper-Bessemer

THE COOPER-BESSEMER CORPORATION
DEPT. E., MOUNT VERNON, OHIO

placed in the bar where it centers itself when the cone and knurled nut are tightened and locked.

The pilot of the tool is tapped for a screw which holds bushings for various sizes of drilled holes. Regardless of how many times the cutter is resharpened, the cutting edge always remains in the same relative position. Only the cutter needs replacement when used up.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

PNEUMATIC COLLET FIXTURE (M24)

Mead Specialties Co. has announced a new precision collet fixture for drilling, milling, and similar operations. The

Air-Operated Collet Fixture

company says the unit provides a powerful grip on round, hexagonal, or square work.

Maximum capacity of the collet is 1" round, 23/32" square and 7/8" hexagonal pieces. The valve may be foot-operated or mounted for automatic operation by the machine on which it is used.

TAP GRINDER (M25)

Developed as a practical, inexpensive tool for regrinding dull or worn taps to correct chamfer and relief, a tap grinding tool that can be used on any tool grinding machine or lathe with tool post grinder has been developed by Minn-Kota Manufacturing Co.

According to the company, savings effected by reclaiming one large tap will pay for the grinder. Right or left hand plugs or taper taps may be ground to any degree of chamfer and relief. Taps with broken teeth may be ground off to the break and new relief and chamfer ground. THE END

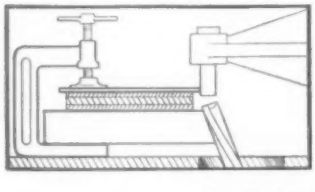
Tap Reconditioner

A NONFERROUS Metal Working Machine

★

To Mill Constant or Varying Bevels . . . . . and to Profile or Trim

On this Onsrud machine, the cutter spindle tilts forward or backward and may be set to make any angle with the table up to 20° off-vertical. The cutter is directly driven by a 10,800 RPM high cycle electric motor. Thus the A-69 Tilting Spindle Shaper makes easy and fast the work of accurately beveling nonferrous materials. Setup is simple and templates or patterns used in conjunction with the tilting spindle shaper solve many production problems.



The relation between the work and the cutter, guide pin and pattern is schematically illustrated here. The cutter is set at an angle to produce the bevel desired. The A-69 eliminates the need for special cutters or complex fixtures to produce any bevel within the range of the spindle's tilt.

Trimming and profiling are other operations to which the A-69 is particularly well adapted.

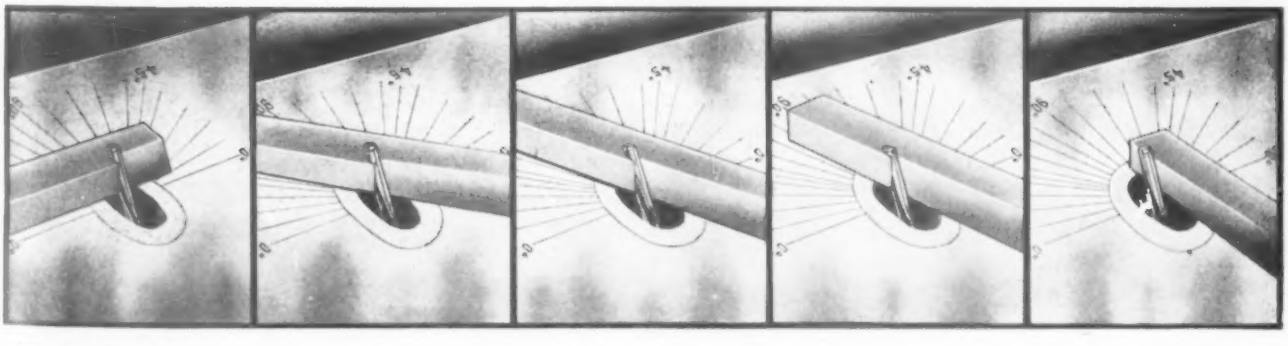
Bevel angle may be varied without changing the spindle angle by simply changing the angle of approach at which work is fed. With this "sweep" technique it is relatively easy to produce varying bevels on work.

Your copy of a free bulletin describing this unique, versatile machine will be sent on request. Write today.

ONSRUD MACHINE WORKS, Inc.
3927 Palmer Street, Chicago 47, Illinois
Sales Offices in all Principal Cities

The illustration below shows how "sweeping" the work around the tilted spindle during feed produces a varying bevel. Note that the spindle angle remains unchanged—bevel variation is produced by change in angle at which work is fed.

Patent No. 1-991-623 469-158



IS **CHROMIUM PLATING** YOUR ANSWER TO EXTENDING THE LIFE OF VALUABLE TOOLS AND EQUIPMENT?

CHROMIUM PLATING

overcomes replacement problems of many parts subject to corrosion and abrasion

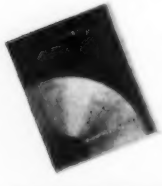
DO PARTS of your vital equipment come in contact with corrosive or abrasive materials? Do you want to keep these parts on the job longer . . . and reclaim them when worn? These advantages—made possible in countless cases by chromium plating—may be the answer to your problem.

For example, the extreme hardness and low coefficient of friction of chromium greatly reduce packing wear and virtually eliminates scoring of truck and tractor pump shafts. Chromium plated piston rods on hydraulic pumps outlast unplated pistons four or five times, eliminate rust and reduce frictional resistance.

On the rotors and cases of plastic mixing machinery, chromium resists attack by the corrosive compounds. Roll and roller bearing parts show no signs of wear after years of severe outdoor service. In addition, these and hundreds of other parts can be put back into service when worn simply by building them up with chromium in a fraction of the time required for new parts.

FOR MANY OTHER EQUIPMENT PARTS

These are just a few of many ways that chromium plating saves valuable materials and man-hours for war production—by reclaiming hard-to-replace machine tools and equipment parts that have been worn or machined off-size and would otherwise have to be scrapped. Successful applications for both new equipment and salvage include:— taps, reamers, broaches and burnishing bars, jigs and fixtures, dies and mandrels, plug and ring gauges as well as many types of shafts, axles, cylinders, pistons and rings.



◄ **Booklet describes these applications in detail**

"The Last Thousandth of an Inch" will assist in determining the applications for chromium plating on your own parts and equipment. In writing for a copy, please mention The Tool Engineer.

UNITED CHROMIUM
INCORPORATED
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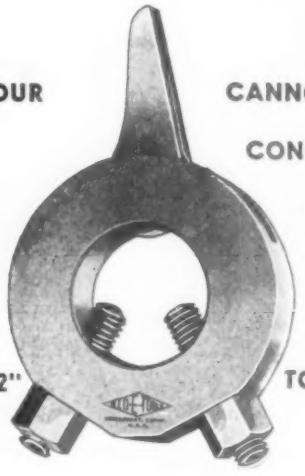
EASY TO ADJUST!
QUICK IN ACTION!

THIS RED-E CAM ACTION GRINDER DOG

MADE IN FOUR SIZES TO TAKE ALL SIZES OF WORK FROM ¼"-2"



CANNOT SLIP
CONCEALED SPRING HOLDS CAM TO WORK

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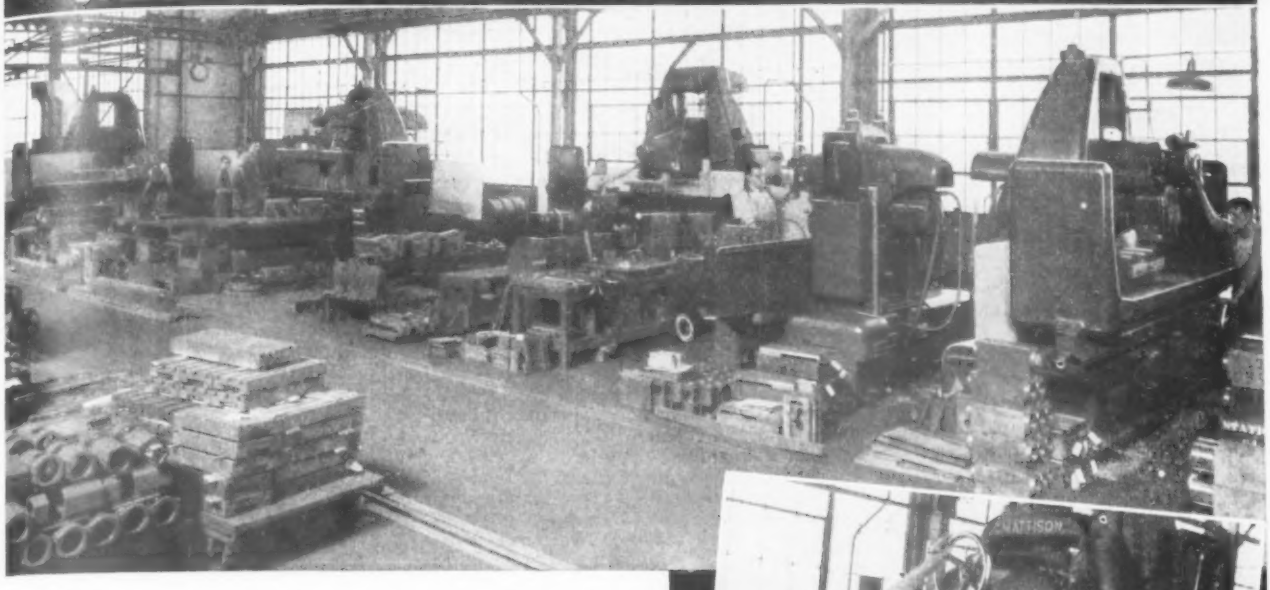
GAMMONS OF *Manchester*

PRODUCTION TOOLS

ORIGINATORS AND MANUFACTURERS OF HELICAL FLUTED TAPER PIN REAMERS

THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.

GRINDING INSTEAD OF SCRAPING REDUCED MAN HOURS 75%



The policy of "grinding instead of hand scraping wherever possible" has resulted in a 75% saving of man hours for a prominent Detroit Manufacturer. Because of this saving, 80 out of 125 employees in the Scraping Department were released for important service elsewhere in the plant. This is mighty important now when every minute, every hour and every man counts.

Jobs are being routed through these Mattison Grinders that were previously thought impossible to grind. Special fixtures permit the handling of jobs, such as shown in close-up views, at a considerable time saving. Parts with angular or hardened steel ways are also ground to closest accuracy and fine finish.

Grinding, instead of scraping, means time saved and faster production, which in turn, results in a saving of man hours. This is a mighty important point that warrants your careful consideration. Write for complete details on the Mattison High-Powered Precision Surface Grinder and free set-up book showing further examples of the capabilities of this machine.

SET-UP SHEETS

Containing complete information regarding these and similar jobs will be sent upon request.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

NEW LITERATURE

T. M. REG. U. S. PAT. OFF.

OF INTEREST TO PRODUCTION EXECUTIVES

(879) Heat-Treating Atmospheres

Designated as B-3251, a new 16-page booklet on four basic heat-treating atmospheres is available from Westinghouse Electric and Manufacturing Co. It deals with Endogas, Exogas, Monogas, and Ammogas, which, the company states, are designed to speed up schedules and eliminate rejects.

The booklet explains the chemical reaction, composition, cost, application and equipment needed for each atmosphere. Also included are illustrations of typical furnace applications and schematic and flow diagrams. Another feature is a series of charts designed for quick selection of atmosphere and equipment.

(880) Tapping Machines

Bakewell Radial Tapping Machine No. 1 R. 16 pp. Bakewell Manufacturing Co. This catalog describes and illustrates the company's line of radial tapping machines. In addition to listing the features of the machine, the booklet gives a complete outline of tapping capacities and other specifications.

(881) Heat-Treating

Quenching 52 pp. E. F. Houghton and Co. This book deals with the principles of heat-treating steel and is particularly concerned with conventional and advanced quenching media. It deals with water, oil and salt bath quenches, quenching particles, cooling and conveying methods, and the Houghton quenching media.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 179.

(882) Priorities

Products and Priorities. War Production Board. This new government publication will replace **Priorities** and **Product Assignments,** both of which have been discontinued. Designed to aid business men and government officials in obtaining information on all products, materials, and services handled by W.P.B., the publication will be issued every four weeks.

A master alphabetical index listing every product, material and service under W.P.B. supervision or control is a feature of the bulletin. This will enable readers to determine the numbers of any applicable W.P.B. orders or forms, all necessary C.M.P. references, and the proper W.P.B. division and section responsible for any product, material, or service.

Single copies of the publication are 20 cents, or a year's subscription may be purchased for $2 from the superintendent of documents at the government printing office at Washington. Persons who had subscribed for **Priorities** will receive the new publication for the balance of their regular subscription.

(883) Turret Lathes

Libby Heavy Duty Turret Lathes. 36 pp. International Machine Tool Corporation, Libby Division. This new catalog deals with the features of the Libby Type "H" lathe. It contains complete specifications for all five "H" models.

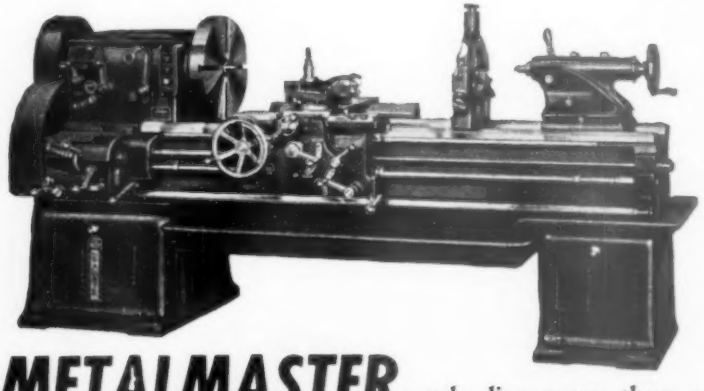
(884) Riveting

Containing all essential information on Cherry blind riveting operations, a new wall chart has been made available to aircraft plants, schools, field service depots, and engineering departments by Cherry Rivet Co.

A special feature of the chart, which is 20" by 30" and printed in color, is a

(Continued on page 204)

BUILT TO "TAKE IT"



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Bradford's experience in building metal-working machinery covers more than a century

THE METALMASTER **embodies more than a century of Bradford experience in building machines with the stamina to stand up under the pounding pace of continuous operation and the harsh treatment of untrained operators.**

- Deep walls, connected by heavy, elliptical, closely-spaced cross-members give rigid support and prevent springing under the heaviest cuts.
- Rugged construction of bed, ways, and frame, coupled with traditional Bradford precision workmanship, make the Metalmaster a leader in any shop.

★ *ALSO MANUFACTURERS OF DRILLING AND TAPPING EQUIPMENT* ★

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PRECISION TOOLS SINCE 1840

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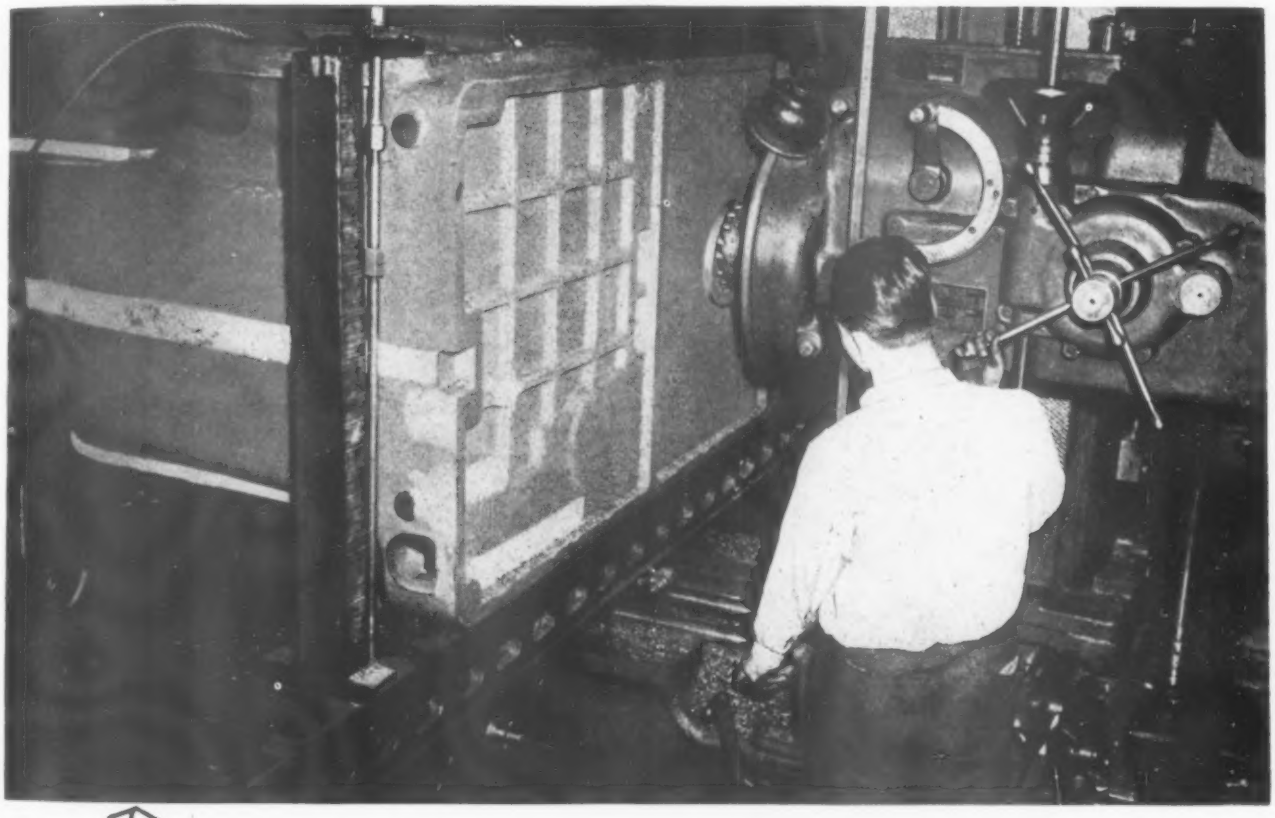
FASTER SMOOTHER EASIER WITH LOVEJOY MILLING CUTTERS

LOVEJOY Milling Cutters have *positive-locking* inserted blades which cut faster, smoother and easier. There are definite reasons for this—the blades are held in the husky forged body so that they are immovable under the heaviest cuts and coarsest feeds—blades are removed, replaced and sharpened easily and quickly—over 50% of every blade can be used—free cutting qualities assure accuracy even when extreme overhang of the spindle is necessary—minimum power is consumed.

Lovejoy cutters enhance the accuracy and production of any milling equipment.

A trial will show the difference—in the meantime, write for catalog No. 26 for full information on standard cutters and blades.



A chance to be patriotic and also take advantage of Lovejoy positive-locking blades—use 50%, or more, of each blade, then sell it to your scrap dealer—High Speed Steel is scarce; use it wisely!

LOVEJOY TOOL CO., INC.

Springfield, Vermont, U.S.A.

scale reproduction of both countersunk and brazier head rivets showing at a glance the proper rivet to use in any thickness of material from .030" to .391". Also included is information on flush riveting and brazier head riveting in various thickness of material.

(885) Power Screwdrivers

Magazine Feed Power Screwdrivers and Motorized Hopper Units. Detroit Power Screwdriver Co. This catalog contains descriptive material on production screwdriving machines and hopper feeding units.

It is well illustrated with pictures showing actual screwdriving jobs, nesting fixture designs, and actual setups for feeding various materials to centerless grinders, presses, and special machines.

(886) Finishing Machines

Packer-Matic Automatics. The Packer Machine Co. has announced a new bulletin, known as No. 14, illustrating and describing its automatic deburring, brushing, polishing, and buffing machines.

The bulletin discusses the various types of machines and the particular work for which each is adapted. It also describes the new addition to the Packer line, a continuous rotary grinding, deburring, brushing, polishing, and buffing machine known as Packer-Matic No. 7.

(887) Copying Machine

Hunter Electro Copyist, Inc., has published a new 24-page catalog describing its copying machine. Prepared especially to show the numerous applications of the device to industrial applications, it lists the various models available and the particular use of each for a specific job.

(888) Electronic Heaters

Designed as GEA-4076, a new eight-page bulletin featuring electronic heaters for heating metals has been published by General Electric Co.

It describes the electronic principle of heating metals, discusses its simplicity, and gives detailed specifications of both the 5-kw and 15-kw 550 kilocycle electronic heaters.

Illustrations of many small parts which may be brazed, soldered, or surface hardened by electronic heating also are included.

(889) Aircraft Parts Scheduling

To assist aircraft manufacturers in placing orders for copper and brass products, the Aircraft Scheduling Unit of the Army Air Forces has published a new catalog of brass mills and their products.

The catalog, which includes a list of 71 brass mills, covers eight major products. It is especially designed to help aircraft manufacturers avoid lost effort by assisting them to place their orders with the proper mills.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 179.

(890) Engineering Data Book

Turret Lathe Tools. Foster Division of International Machine Tool Co. Available to persons who own and operate Foster Fastermatic turret lathes, this book contains 26 pages of engineering data of use to men operating this type of equipment, as well as information on standard and special tools for the manufacturer's Fastermatic lathe. Extra copies are sold at $2.50.

It contains descriptions and specifications of all tools made for turret type and platen type automatic lathes. Engineering drawings and illustrations show tool dimensions necessary for set-up men, master mechanics, time estimators, and tool engineers who plan and operate production of parts. Also included are hints on increasing production by unusual cuts and doubling up operations and suggestions for sharpening drills, flat tools and boring tool bits.

(891) Metal Cleaning

Howard Metal Cleaning and Finishing Machinery. 32 pp. Howard Engineering and Mfg. Co. The new catalog contains information on war and post-war applications of metal cleaning and finishing machinery.

The book discusses in detail the problems involved in cleaning and finishing metal parts and takes up the various types of cleaning machines, methods

(Continued on page 206)

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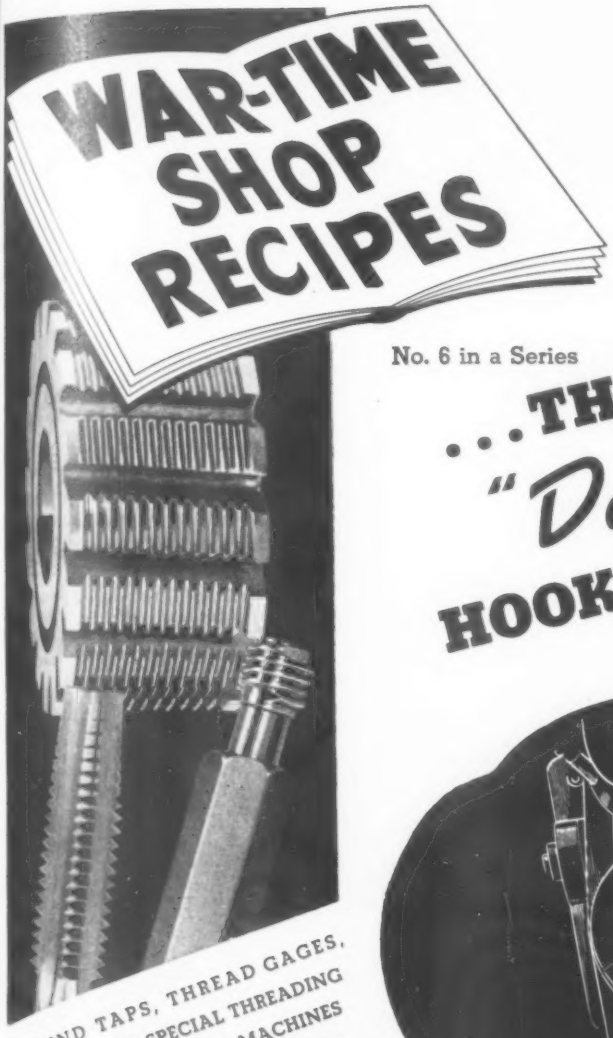
NAVY
A Star
HAS BEEN
ADDED
"You have continued to maintain the high standards that you set for yourselves and which won you distinction more than six months ago."
ROBERT P. PATTERSON
Under Secretary of War
PUTNAM TOOL COMPANY
2987 Charlevoix Avenue • Detroit 7, Michigan



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TO CHECK YOUR THREAD HOBS FASTER . . . . . .

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. . . THE NEW "Detroit" HOOK-CHECKER

Designed by Detroit Tap and Tool Company to speed production checking of its own thread milling cutters, this new universal hook-checker is being made available to industry generally.

It does not require special setting up for each 'hob'. All you do is slip the cutter between centers, bring a knife edge against the ground side of the sharpened face, by turning a micrometer until you can't see light between the two. Read the 'mike'. A convenient table then tells you whether the cutter is right or how much it is off. A dial tells whether flutes are correctly spaced.

Ask for bulletin No. HC-43 covering this new checker. It also gives useful hints as to sharpening of thread milling cutters.

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DETROIT TAP & TOOL CO.

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DETROIT, 11
MICH. U.S.A.

and materials. Other sections of the book discuss cooling and drying equipment. Also included is information on Howard metal cleaning and finishing machinery.

(892) Grinding Wheels

Facts About Koolpore Grinding Wheels. 4 pp. Bay State Abrasive Products Co. This new booklet just off the press contains specifications and other information about the various types of grinding wheels made by the company. Two tables are included, showing tool and cutter recommendations and surfacing recommendations.

(893) Chucking

The Zagar Collet Chucking Fixture. 8 pp. Zagar Tool Co., Inc. This illustrated booklet in color describes the company's universal device for indexing or holding work on machine tools. It outlines features of the two types available, one for holding and indexing and the other for holding only.

Applications of the fixture on various operations are illustrated, together with instructions for set-up and operation.

(894) Production

DoAlls on Production. 98 pp. Continental Machines, Inc. Showing actual production with the DoAll line of metal-removing machinery, this pictorial presentation of applications to particular jobs is very well done. Photographs are excellent for their detail and general interest.

The book is divided into nine sections, dealing with mass production, "three dimensional" production, short run--stampings, special fixtures for handling production jobs, continuous filing operations on production jobs, special work, contour sawing, attachments for DoAll machines for greater versatility, and features of the DoAll line.

Pictures show the machine at work in manufacturing plants and the accompanying text describes the particular operation in detail.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 179.

(895) Gage Use

Of interest only to users of the Federal Model 1201 series of dial indicator hole gages, a new instruction booklet is offered by Federal Products Corp.

Being written especially for users of this model gage, it concentrates on handling, reading, setting, and miscellaneous details for its accurate use.

(896) Gear Transmissions

Turner Uni-Drive. 16 pp. Turner Uni-Drive Co. Devoted to information about this manufacturer's line of gearbox drives, this booklet deals with the various units available for use on lathes, shapers, milling machines, screw machines, and other machine tools. Drawings illustrate each of the various models.

(897) Diamond Tools

Diamond Impregnated Dressing Tools. Wheel Trueing Tool Co., Inc. The second in a series of booklets being published by this company, the bulletin described an impregnated dressing tool for use on external, internal, centerless, and surface grinders.

It contains, in addition to features and applications of the tool, a table of recommended dresser sizes for different wheel faces and diameters.

(898) Engineering Service

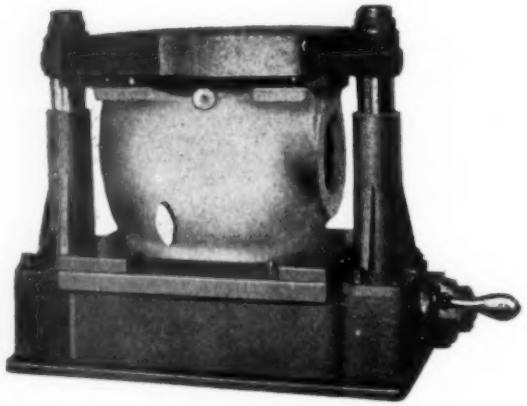
McKinney Tool and Mfg. Co. has available a four-page folder describing its various tool engineering services. It outlines the company's facilities for designing and building tools, jigs, fixtures, dies, gages and special machinery; and for process engineering, product designing, plant layout, routing, and experimental and development engineering.

In addition to listing the various types of equipment available, the folder also discusses personnel qualifications.

(899) Carbide Tools

Designed as **Bulletin 143,** a new eight-page catalog covering all grades and classifications of Willey's metals is available from Willey's Carbide Tool Co. In addition to listing prices of all standard tools made by the company, the booklet contains a table of specifications and suggested speeds for various operations and types of cuts on different metals.

THE END



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Simple adapters added to a standard fixture starts your production faster.

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RESULT IN ECONOMICAL TOOLING AS FIXTURES CAN BE USED AGAIN ON SUBSEQUENT TOOLING PROGRAMS.

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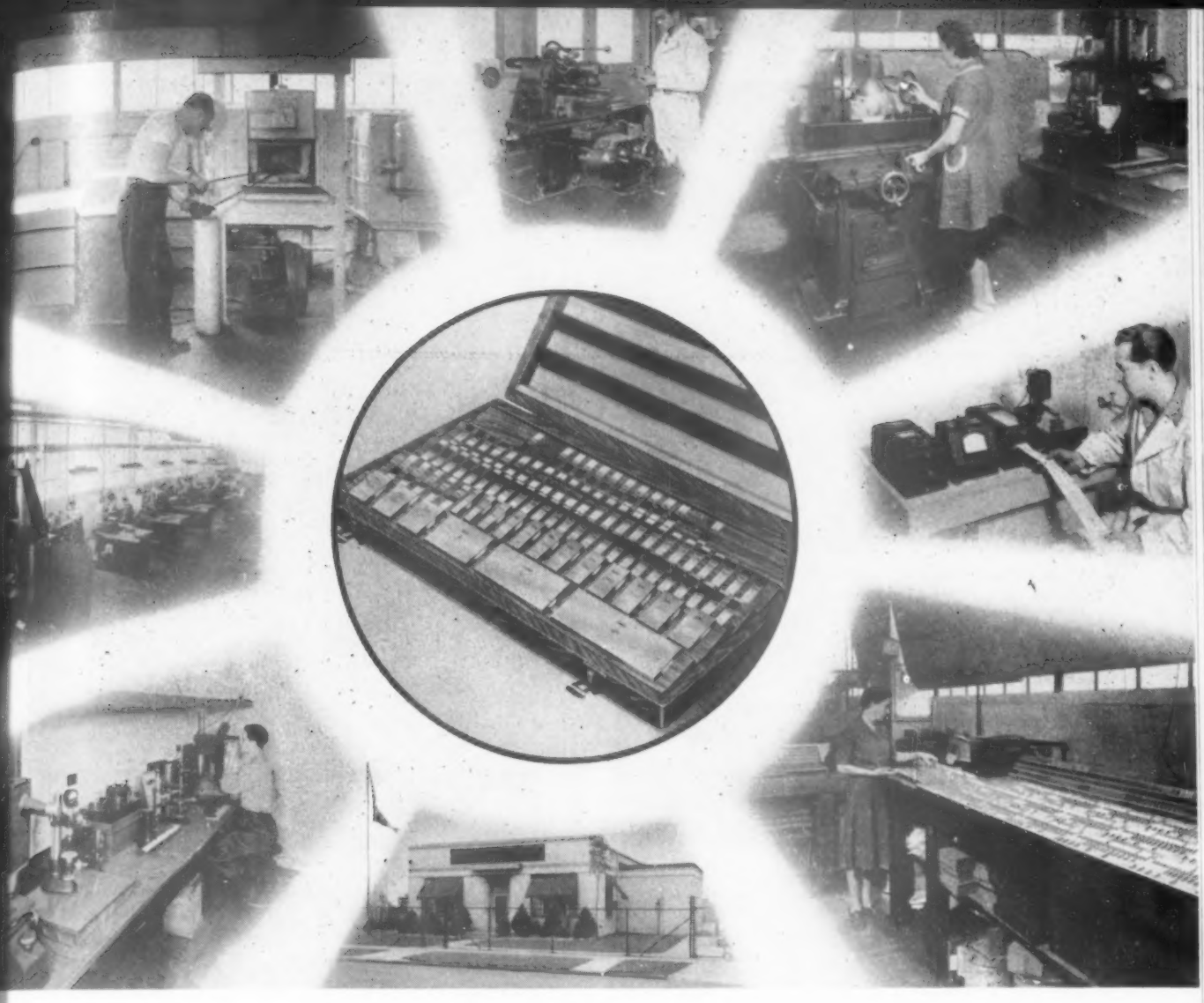
Philadelphia, Pa.—Morgan Tool & Equipment Co.



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"I like Threadwell Taps because every ground thread tap is packed in a transparent plastic container with a metal screw cap. This insures its safe arrival on the job and makes it easy to identify the size and style without unwrapping."

The popularity of Threadwell Taps is due to these things in part, but principally it is due to their fine performance on the production line. In war plants from coast to coast they are setting new performance records every day.

If you have not "discovered" Threadwell Taps, get in touch with your Threadwell distributor. You will find him ready to help you with your threading problems.

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Avoid Spoilage Losses!

If you are having spoilage losses due to oversize or bell-mouthed holes, there's a simple way to remedy the situation. Do as others are doing and change over to the Ziegler Floating Tool Holder!

By automatically compensating for inaccuracies in spindle alignment up to as much as 1/32", the Ziegler Holder overcomes the difficulties that are quite universally being encountered these days with inexperienced help.

Made to Fit Any Machine

Furnished with male or female taper—and straight, threaded or special shanks to fit any machine used for tapping or reaming.

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LATER - - FOR POSTWAR TOOLING

Now we are turning out special cutting tools of many types for an army of defense plants. Later we will be ready for postwar tooling problems with new methods we have learned, for better, faster work.

Note: We manufacture no tools for stock. Send us your inquiries for prompt estimates. Bulletin 201 on request.

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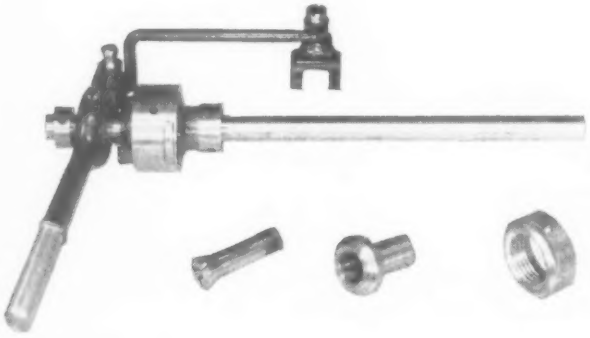
This heavy-duty collet closing attachment is typical of Crozier leadership. Improved design originated by Crozier-craftsmen years ago. Has often been imitated, it has not been equalled. Adapted to standard and 1-A, 3-C or 3-SB collets.



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Ideal for second operation work. Converts Atlas, Logan, South Bend and other small lathes to high production units. Allows changing stock while spindle is running. Precision construction. Trouble free. One-half inch capacity—$65. Other sizes priced in proportion. Send today for complete information.

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Air Hardening, Non-Deforming, Cobalt High-Carbon, High Chromium Steel

For Long Production Runs

Grinds super keen. Unsurpassed for dies requiring a perfect edge for eliminating flash, a high polish and minimum deformation.

Dies of PRK-33 Cobaltcrom punch out four carloads of landing mats per diem, without regrind in over 90 days. Work on 4 plates a minute, 12½ lbs. of material per stroke.

Preferable to high speed steels for non-ferrous cutting tools.

Castings of PRK-33 Cobaltcrom eliminates up to 80% of machining. Furnished within ⅛" of finished size.

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SHOWING CHUCK ATTACHMENT

Machine uses No. 5-C Rivett Collet—a popular size which many plants now have. Has single lever control—starts-stops-applies brake, opens and closes collet.

Has 4-step V-Belt Drive—Threaded nose spindle for use of 4" 3-jaw universal chuck—

Send for complete Bulletin.

REYNOLDS MACHINERY CO.
211 EDDY STREET PROVIDENCE, R. I.

FREE TO EXECUTIVES

for EMPLOYEE TRAINING

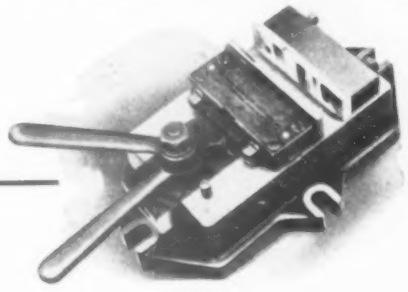
You will say, like hundreds of others, this is the best book for its purpose ever printed. Employees like it because it's clearly illustrated—easy to read. Tells how to use gage blocks, sine bar, vernier instruments. Chapters on history of measurement, care of gages, etc. Write on your letterhead. No charge of course.

JANSSON GAGE COMPANY

19208 Glendale Avenue • Detroit 23, Michigan

THIS MILLING VISE

Speeds Gripping and Releasing!



POWER, SPEED, STRENGTH, and ACCURACY are obtainable with this Hartford "Four Point" Milling Vise. It features a dual-operation principle of handles which speeds gripping and releasing. The operator can easily apply tremendous power with one hand because both the cam-faced and binding handles can be manipulated at the same time. You get maximum strength because the base is of semi-steel and the movable jaw is single heat-treated steel drop forging. The movable jaw can accurately hold a single piece at either end of jaw because it has ground fitting surfaces. Jaws are in absolute alignment.

WRITE FOR LITERATURE

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

TAPS FOR SHIPMENT FROM STOCK
Subject to prior sale

HY-PRO

"HY-PRO means High Production"

STANDARD HIGH SPEED STEEL HAND TAPS, TAPER, PLUG, OR BOTTOMING POINT

SIZE	PG 01	PG 1	PG 2	Coml Grnd	Cut Thr
1/4-20 2 flute	X		X		
3 flute		X			
4 flute	(X)	(X)	(X)	(X)	(X)
1/4-28 2 flute	X	X	X	X	
3 flute					
4 flute	(X)	(X)	(X)	(X)	X
5/16-18 2 flute		X			
3 flute					
4 flute	(X)	(X)	(X)	(X)	(X)
5/16-24 2 flute					
3 flute					
4 flute	X	X	(X)		
3/8-16 2 flute					
4 flute	(X)	(X)	(X)		
3/8-24 3 flute					
4 flute	X	X	(X)		
7/16-14 3 flute					
4 flute	X	(X)	(X)	(X)	
7/16-20 3 flute					
4 flute	X	X	(X)	(X)	
1/2-13 3 flute					
4 flute	(X)	(X)	(X)	(X)	(X)
1/2-20 3 flute				X	
4 flute	(X)	(X)	(X)	(X)	(X)

SIZE	PG 01	PG 1	PG 2	Coml Grnd	Cut Thr
9/16-12 4 flute	X	(X)	(X)	(X)	
9/16-18 4 flute	X	X	X	X	X
5/8 -11 4 flute	X	(X)	(X)	(X)	(X)
5/8 -18 4 flute	X	(X)	(X)	(X)	(X)
11/16-11 4 flute					
11/16-16 4 flute					
3/4					
1 3/8-6 4 flute	X	X	X	X	X
1 3/8-12 4 flute					
1 1/2-6 4 flute				X	X
1 1/2-12 4 flute					

Ask to have your name put on our mailing list to receive these lists of HY-PRO Taps for Shipment from Stock

STANDARD HIGH SPEED STEEL HAND TAPS, SPIRAL POINT

SIZE	PG 01	PG 1	PG 2	Coml Grnd	Cut Thr
1/4-20 3 flute	X	(X)	(X)	(X)	
1/4-28 2 flute	(X)	X	X	(X)	
5/16-18 2 flute	(X)	(X)	X	X	X
5/16-24 2 flute	X	X	(X)	(X)	X
3/8-16 3 flute	X	(X)	(X)	(X)	X
3/8-24 3 flute	X	X	X	X	X

SIZE	PG 01	PG 1	PG 2	Coml Grnd	Cut Thr
7/16-14 3 flute	X	(X)	(X)	(X)	
7/16-20 3 flute	X	X	(X)	(X)	X
1/2-13 3 flute	X	X	X	X	
1/2-20 3 flute	X	(X)	(X)	(X)	

X - Less than 100 pcs. (X) - More than 100 pcs.

HY-PRO TOOL CO.
New Bedford, Mass., U.S.A.
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Columbia TOOL STEEL

OUTSTANDING PERFORMANCE—

Current demand for outstanding performance calls for Good Tool Steel Tools.

If you need better performance, try Columbia.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE, PRESIDENT
GENERAL OFFICE AND WORKS
520 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

HANDY ANDY *Says*—

T.M. REG. U.S. PAT. OFF.

MANY things have happened since this swivel chair travelogue was started, most of them favoring the Allied cause.

In my belief, however, a quick conclusion of the war is so much wishful thinking despite Italy's surrender. There's still the long road to Berlin to travel, and many an isle to hop before our boys pick cherries in Tokio. Yet, indicative of the tidal wave of revolt that will inevitably sweep fascism from the face of Europe, the Danes—and unarmed at that!—have started a premature second front in the North. Base ingratitude, that, after the nice way Hitler has policed their country. You know, biting the hand that (un)fed them, like.

But, as Hans Christian Anderson said in his little book, "When Holger Danske wakes . . .!"

But, we're detouring, and I want to wind up this travelogue by Christmas. We now go to Russia, until recently terra incognito to most westerns and right now a pain in the neck to Hitler.

▲ ▲ ▲

About the time Columbus rediscovered America, Russia was a mere blob on the Continental map, but has since spread until she extends from the Arctic to the Levant, from the north Pacific to the Baltic Sea.

Yet, because of physical and geographical boundaries, she is practically land-locked. Japan dominates the eastern ports; Turkey, her access to the Mediterranean, and Germany (temporarily) the narrow exit from the Baltic Sea. Only Murmansk, far inside the Arctic circle, affords free access to the Atlantic, and then by circuitous route via the Barents Sea.

▲ ▲ ▲

By popular belief, Russia is seasonally a land of cold and scorched earth. Siberia, especially, has been deemed a barren in whose tundras the mastodon settled down for his ageless sleep.

Actually, Siberia flows with milk and honey, is colossally rich in mineral resources. And Russia, as a whole, has vast potential wealth, can be practically self sustaining. Besides varied agriculture, including excellent cotton, there are vast forests and vaster grazing lands. Hence, Russia will likely become a serious contender in post-war pulp, beef, textile and metal goods markets. She needs only seaports.

▲ ▲ ▲

Prior to the Revolution, Russia wallowed in medievalism. She was an extreme of poverty and wealth, of mental torpor and intellectual brilliance. The masses, enthralled alike by state and Orthodox church, were steeped in ignorance and superstition.

Cruel though it was, the revolution released the pent-up intellectual energy of centuries, an energy with which the post-war world must eventually deal . . . not by force, not by war—although there are bodies that insinuate that extreme—but through understanding and consideration of mutual rights. The Russian is innately friendly and inclined to respond to sincerity, yet, has cause to be suspicious of the West. For, while we impute ambiguous policies to the Reds, ours are as vaguely defined because there is no unanimity.

▲ ▲ ▲

The West has impugned Soviet Russia immoral and godless. Well, when did the West extend sympathy and encouragement to a people that, held at a spiritual and physical nadir, sought regeneration through the only means at their command—revolution?

And as for atheism, what mortal can look into the composite soul of 180 million people and declare it godless? Look, rather, into the hearts of Russia's women, doubtless praying for their sons and mates even as our women pray for theirs.

Or, unlock the breasts of the legions of Russian dead who have fallen for their homeland, and read your answer there!

(Concluded on page 214)

STYLE 11

Rejections, due to excessive taper caused by tool wear, prevent economical production by wasting valuable metal and man hours. Through the use of KENNAMETAL steel-cutting carbide tools this scraping or reworking of finished pieces can be minimized.

KENNAMETAL is specified for accurate machining because its hardness and wear resistance give it the ability to "hold size" on long cuts. Moreover, such accurate steel-cutting often permits roughing and finishing cuts to be combined in one. If your shop machines precision parts, KENNAMETAL will increase your production.

Your copy of the new KENNAMETAL Catalog 43-C will be sent upon request.

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KENNAMETAL *Inc.*

600 Lloyd Ave., Latrobe, Pa.

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Foreign Sales
U. S. STEEL EXPORT CO., 30 Church St., New York

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Almost as quickly, you can "see through" the facts of balance in any rotating part.

The amazing speed and accuracy of Gisholt Dynetric Balancing is achieved with electron tubes through which unbalance vibrations as small as .000025" are clearly recorded on a sensitive meter. Such extreme accuracy is not required in commercial balancing, yet it indicates why Gisholt Dynetrics are pre-eminent in the field for balancing any part from 1 ounce to 50 tons.

GISHOLT DYNETRIC BALANCING MACHINES *are protecting many vital war products against vibration, bearing overloads, and excessive wear. Literature on Dynetric Balancing is yours for the asking.*

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KEEP AHEAD
With Gisholt Improvements

The Army-Navy "E" and the Treasury Flag fly side by side at Gisholt.

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HERE'S HOW *Eureka* TOOL STEEL ELECTRODES CONSERVE TOOL STEEL

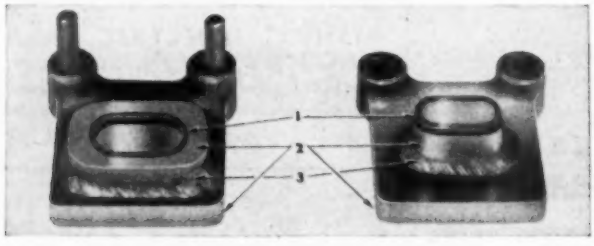


Illustration shows typical fabricated dies. Arrows 1 point out tool steel electrode deposits used as cutting edges, neither of which are over $\frac{3}{16}$ inch thick. Arrows 2 indicate machine steel used instead of tool steel to lower die composition cost, and 3 refers to construction welds made of mild steel rod to hold die parts together. In most cases heat treatment is not necessary.

—HANDY ANDY SAYS—

(Continued from page 212)

▲ ▲ ▲

To understand the other fellow, you must put yourself in his place; you must see yourself as in a mirror.

Now, I am a native-born Scandinavian and, as such, rather conservative. Certainly anything but "pink". For centuries, Russia has been the traditional enemy of my people. Yet, I am writing objectively and, on the whole, with realistic views on differences which must be reconciled if we are to achieve universal peace.

I have shown glimpses of the intense nationalism which pervades Europe, and which largely precludes any "union now" except as it may cohere racially or culturally kindred peoples. Russia will be vitally concerned with such coalitions, especially those which may endanger her future safety.

▲ ▲ ▲

What, now, are Russia's objectives? What will she want and demand?

Well, having seen the impotence of minority buffer states as barriers to invasion, she may decide on protectorate over Poland and adjacent Baltic states, with probable autonomy or state rights within the Soviet Union.

She may demand Finland, whose splendid and courageous people are nevertheless so embittered, and so obstinate, that warped judgment may sway them against a negotiated peace. Now is the time to effect a truce!

As a growing industrial nation, she will want access to the seas, hence, retention of the Baltic states. However, free ports may be negotiated, with probable trade advantages accruing to the nations that provide them.

She will demand the right to shape her own destiny, not have it carved for her. She has earned that right, and it is my belief that, out of the crucible of war, Russia will emerge a great and progressive democracy. She will be a force for world peace.

It is also my belief that whatever agreements Soviet Russia makes she will keep, even as she has religiously (?) kept all pacts until broken by the co-signer.

At any rate, better the pen than the sword—with Russia. And, better that the wealth of the world be poured into the coffers of Irene—goddess of peace—than into the maws of Mars.

THE END

MARITIME "M" AWARDS for Outstanding Production Effort

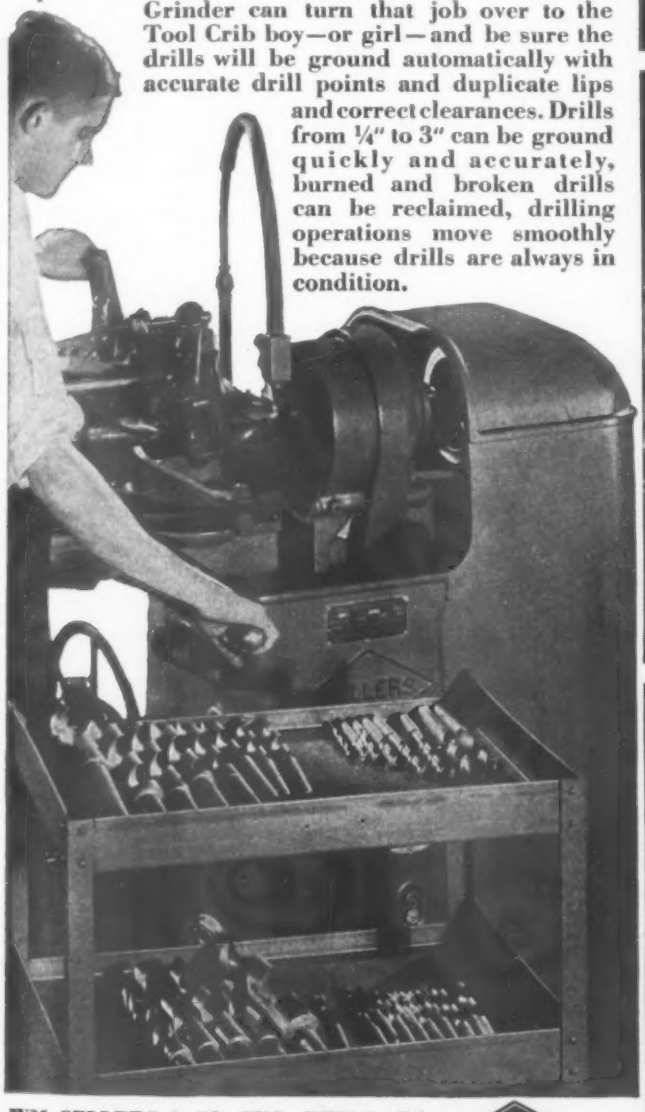
Recent recipients of United States Maritime Commission awards included two shipyards and eight manufacturing companies.

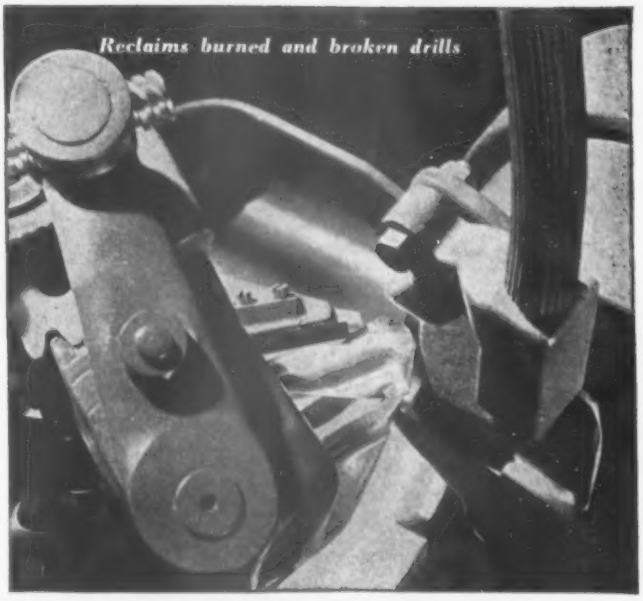
The shipyards: Froemming Brothers, Incorporated, Milwaukee, Wisconsin; Southeastern Shipbuilding Corporation, Savannah, Georgia.

The manufacturers: Baltimore Copper Paint Co., of Baltimore, Md.; Bethlehem Steel Co., Bethlehem, Pa.; Devoe & Reynolds Co., Inc., New York, N. Y.; Inland Steel Company, Chicago, Ill.; Jones and Laughlin Steel Corp., Pittsburgh, Pa.; Republic Steel Corporation, Cleveland, Ohio; Worthington Pump and Machinery Corp., Harrison, N. J.; Youngstown Sheet & Tube Co., Youngstown, Ohio.

The SELLERS Model 6-G Drill Grinder is Ideally Suited to Present Day Operating Conditions

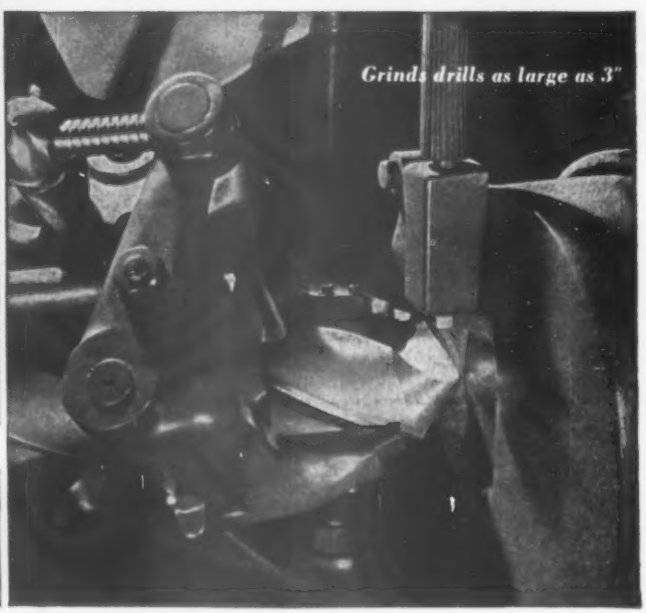
AUTOMATIC!—that is one feature that makes the Sellers Drill Grinder invaluable today. With inexperienced, newly-trained operators, drill grinding can no longer depend on the skill of the old-time machinist who prided himself on his ability to grind tools. The machinist is busy on more important work. So the shop with the Sellers 6-G Drill Grinder can turn that job over to the Tool Crib boy—or girl—and be sure the drills will be ground automatically with accurate drill points and duplicate lips and correct clearances. Drills from ¼" to 3" can be ground quickly and accurately, burned and broken drills can be reclaimed, drilling operations move smoothly because drills are always in condition.





Reclaims burned and broken drills

Grinds drills as small as ¼"



Grinds drills as large as 3"

WM. SELLERS & CO., INC., PHILA., PA.

FOUNDED SELLERS 1848

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MULTIPLE CHARACTERS

with Matthews
'Champion' HOLDER

Made for hand stamping or press use... Matthews 'Champion' Holder can be used for 90% of all heavy or medium duty marking applications. Type changing is amazingly fast... marking is clean cut and in alignment. Write for Catalog 146-A for full particulars.

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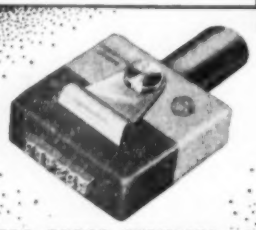

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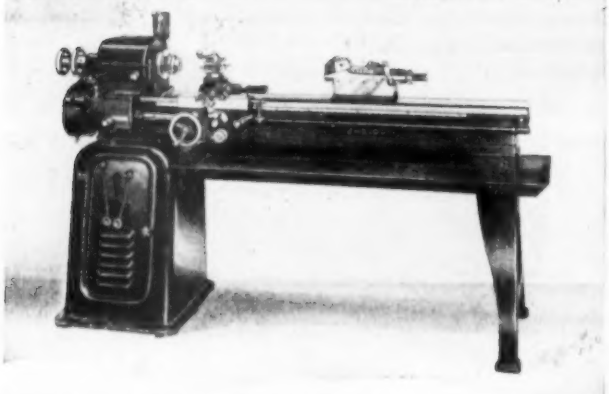
SHELDON



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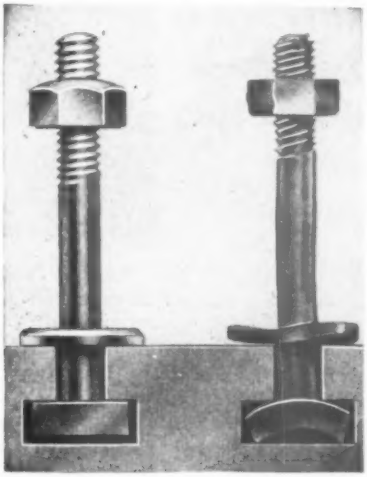
Best known as quality tool room lathes, SHELDON Precision Lathes are also ideally suited for much second operation and other production work because of their extra collet capacity, sturdy construction, accuracy and available production features including: Lever operated Bed Turret, or Tool Post Turrets, Lever operated Collet Attachments, Tailstocks, Double Tool Posts, 4-speed underneath motor drives, etc. If you are looking for a 10", 11" or 12" Precision Lathe for the Tool Room or Production Line, be sure to see the SHELDON Lathe before you order.

SHELDON MACHINE COMPANY, INC.
4252 N. Knox Ave. CHICAGO 41, U.S.A.

GOOD MACHINE BOLTS ARE CHEAPER THAN REPAIRS TO COSTLY MACHINE BEDS



Ordinary machine bolts, nuts and washers of soft steel can show wear and distortion quickly and if continued in use, may cause expensive repairs to machine beds and costly loss of time.

Boyar-Schultz SMB Bolts, made of special heat treated steel are machined with heads square with bodies. Heads present a flat surface to the upper side of the T-slot. They hold work in exact position for heavy cuts and safeguard the machines accuracy.

SMB Nuts and Washers are also heat treated and carefully made. Threads cut square with face of nut.

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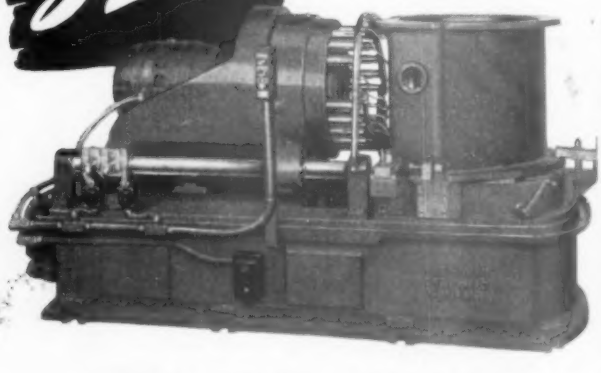
SPECIALISTS IN—
MULTIPLE DRILLING EQUIPMENT



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is a special tapping machine with lead screw for tapping seventeen ½-inch-13 holes.

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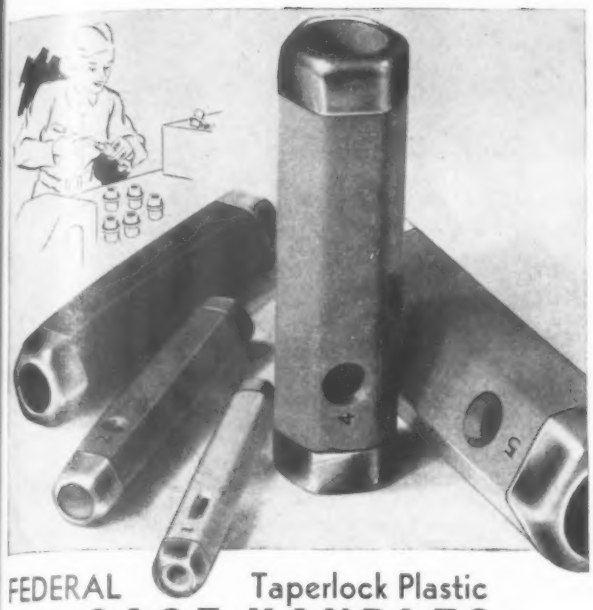

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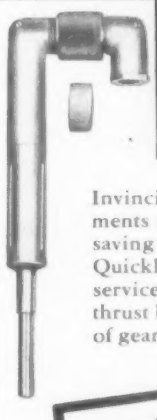

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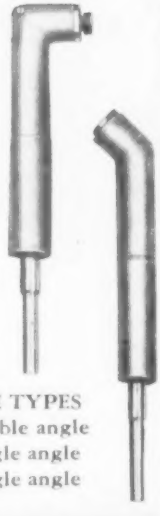

- The Ball Wears—Not the Gears
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THREE TYPES
90° double angle
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Feed Work Fast to Drill or Tap!

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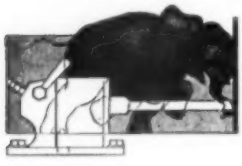

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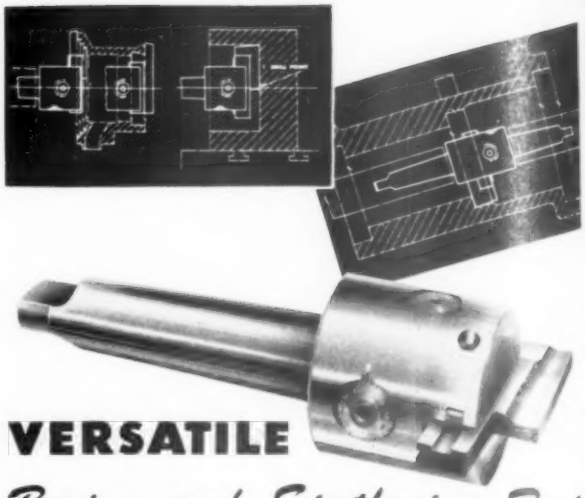

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It will enable you to produce more accurate work with fewer motions in much less time. Users consider it one of the most valuable tools in their tool rooms.

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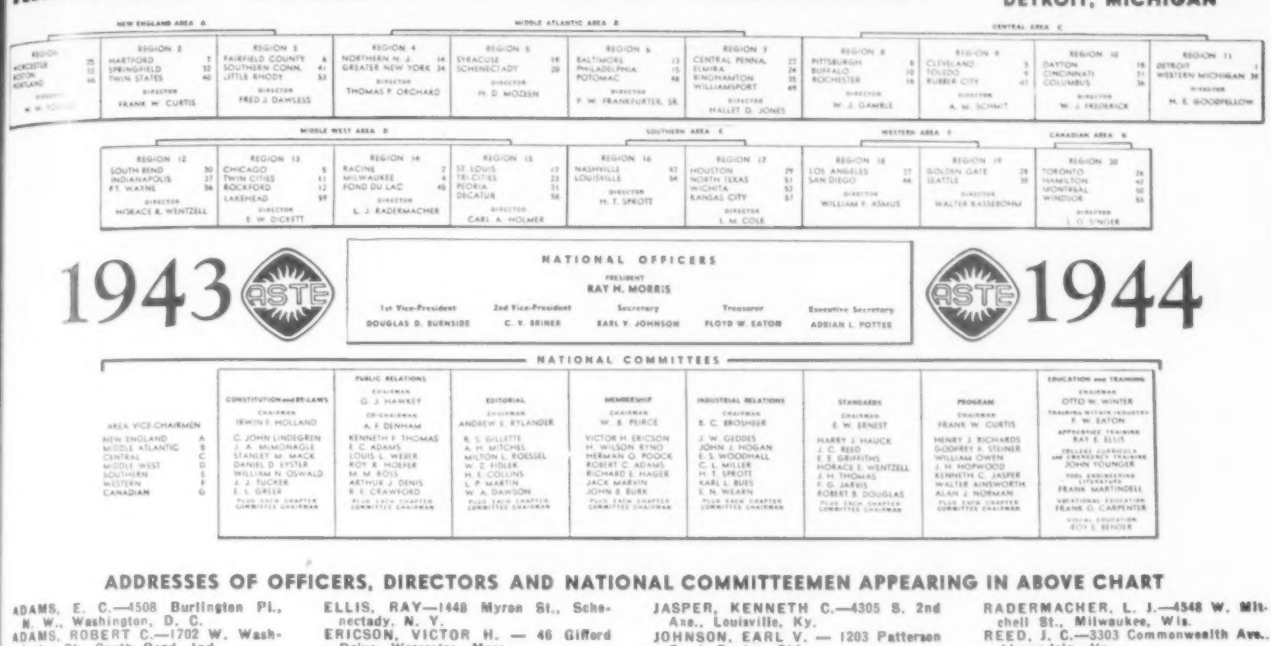

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o Senior initiation fee is five dollars. Dues eight dollars per year for senior grade membership and five dollars per year for junior grade membership. Junior initiation fee is two dollars.

A. S. T. E. DOINGS

Baltimore: Phillip M. McKenna, president of Kennametal, Inc., visited the October meeting held at the Engineers Club October 6. He spoke on "Milling at High Speeds With Cemented Carbide Tipped Cutters".

Mr. McKenna discussed the methods of application of carbide tipped cutters, methods of resharpening, speeds, table feeds, loads per tooth, actual performance, and physical properties. He used moving pictures and slides to illustrate his talk.

Binghampton: Ninety-five members and guests attended the October 6 meeting at Hotel Sherwood, Greene, New York.

Shop Men Find the MAGNA-SINE INDISPENSABLE!

The sale of one Magna-Sine will mean much less to you than the purchase will to us. May I hope you will aid me in this effort to improve our products and my workmanship?

An excerpt from an actual letter received by the Robbins Engineering Company.

Above is a Magna Sine being used to grind a broach. This set-up took approximately 5 minutes as against a full hour for the old method.

The man who wrote this letter, like most shop men, is proud of the work that he does. So when he took his present job and found that the company did not use the Magna Sine he wrote us a letter asking us to come and sell them one. He knows that the old methods of setting up angular grinding jobs using V-blocks, clamps, angle plates, etc., requires several times as long as doing it with the Magna Sine. And because, with the Magna Sine the angle is determined by gage blocks, the entire set-up is held to the closest possible limits of accuracy.

The best way to determine the true worth of a tool is to ask the shop man who uses it. Thousands of them, like the man we quote above, have found that they cannot get along without the Magna Sine. Write for complete information today. We can give you good delivery.

The Magna Sine comes in two sizes in both single and double angle types. A non-magnetic sine plate for inspection use is also available in the same models.

ROBBINS ENGINEERING COMPANY
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Bradford Reed, president of the Rolled Thread Die Co. addressed the technical session with a talk on the history and present development of thread rolling. He discussed types of threads, steels used in dies, construction and setup, automatic hopper type machines, and the process of rolling threads on micrometers.

Boston: More than 130 members attended the meeting held at Schrafft's Restaurant September 9.

The technical speaker of the evening was Mr. Rose of the Vanadium Alloy Steel Company. He spoke on "High Speed Steel". Also on the program was a talk by Walter Pohle of The Spray Engineering Company, who discussed using regular tool holder bits as reaming and boring tools in situations where regular tools are not available. The motion picture, "Making A Tank", was loaned by the Boston Ordnance District.

At the October 14 meeting, technical speakers were H. F. Hoffman of Cincinnati Milling Machine Co. and Henry Richards.

Mr. Hoffman gave an illustrated talk on cutter sharpening practice as applied to milling machine cutters. Mr. Richards spoke on the topic of plastic vise jaws as a war-time substitute for conventional brass jaws. He reported that the plastic jaws have proved very satisfactory.

Also on the program was the showing of a film on tapered roller bearings furnished by the Timken Roller Bearing Co.

Buffalo: Attendance at the meeting September 16, held at Trap & Field Club, was 168 members and guests.

Technical speakers at this program were R. M. Stanley, Chief Test Pilot for Bell Aircraft Corporation, who spoke on the duties and qualifications of test pilots, and Lester L. Benson, works manager of Bell Aircraft who discussed past, present and future tooling in the aircraft industry.

Mr. Benson substituted for Ray P. Whitman, first vice president of Bell Aircraft, who was unable to fill his previous commitment to address the meeting. Also included on the program was a Bell Aircraft color sound movie "Cannon On Wings."

Central Pennsylvania: Lloyd Wheeler chief engineer for B. M. Root and Co. was technical speaker at the September meeting. He talked on "Applications of Hydraulics to Machine Tools."

Chicago: "Tank and Combat Vehicle Production in the Chicago Area" was the main topic of discussion at the October 4 meeting of the Chicago Chapter.

The principal speakers were Maj. H. J. Prebensen and Capt. H. B. Scoville of the Chicago Ordnance District. They discussed the huge increases in the volume of tank production, choosing as an

(Continued on page 222)

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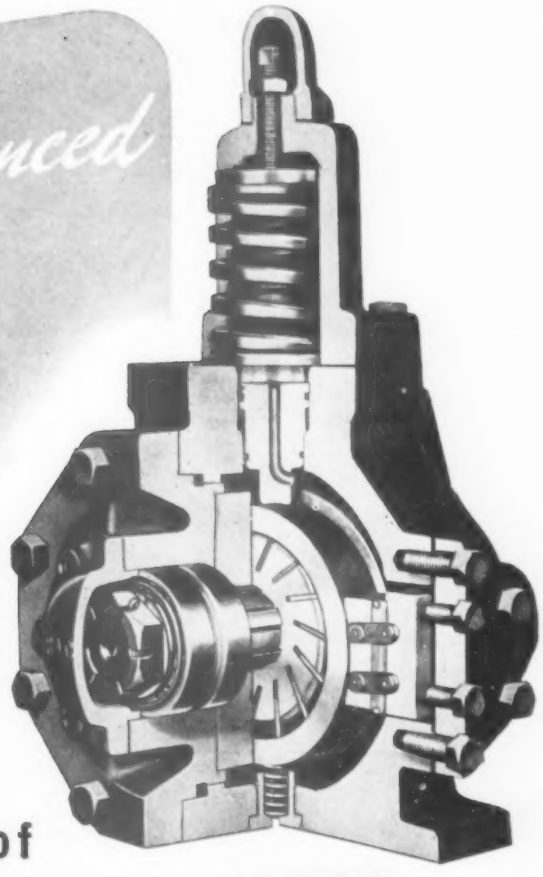

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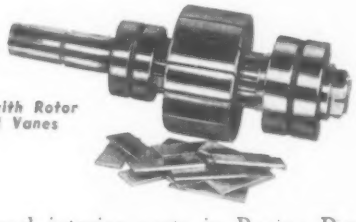

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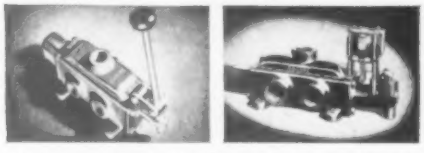

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illustration the tooling breakdown on an end connector part for tank tracks. This particular part was chosen for discussion because it offered an unusual example of conversion to war production with old machine tools not designed for the work.

An estimated 200 members and guests attended the meeting.

Columbus: The monthly dinner meeting was held October 12 in the Crystal Room of the Hotel Fort Hayes.

Because of travel restrictions, C. R. Maxon of the New Jersey Zinc Sales Co. was unable to fill his speaking engagement for the technical session. However, he sent an interesting motion picture, entitled "Die Casting", as a substitute. The film explained production methods and equipment used as well as numerous examples of die casting applications.

Detroit: Between 350 and 400 persons attended the technical session of the October meeting held at the Detroit-Leland Hotel, October 14. Principal speaker was D. A. Wallace, president of the Chrysler, Kercheval, and Jefferson Divisions of the Chrysler Corporation. He discussed Chrysler's "Superfinish" and many ingenious applications for Chrysler automobile motors in connection with present war activities.

Also on the program were movies presented by the Federal Indicator Company on the application of dial indicators, and two short films entitled "Victory in Sicily" and "Battle of Midway".

Elmira: H. M. Huffman, representative of the Cincinnati Milling and Grinding Machine Co. was principal speaker at the technical session at the October 4 meeting held in the Mark Twain Hotel. He spoke on "Cutter Sharpening Practice".

Also included on the program was a sound movie, "We Work for Victory and We Plan for Peace", furnished by the Allis-Chalmers Manufacturing Co.

Fond du Lac: Two technical speakers were featured at the October 8 meeting held in the Athearn Hotel, in Oshkosh, Wisconsin.

Ralph F. Burns, metal division, The New Jersey Zinc Sales Co., presented an illustrated discussion of "Die Castings". The talk covered the art of producing accurately dimensioned castings under the pressure of dies. The casting operation was clearly illustrated.

Also of interest, was a discussion by Dr. H. A. Frommelt, director of industrial research at Kearney & Trecker Corporation, Milwaukee, on current developments in milling operations.

Golden Gate: Frank Curtis, chief engineer, Van Norman Machine Tool Company and past national president, A.S.T.E., was technical speaker at the opening meeting of the Fall season held September 7 at the Leamington Hotel in Oakland.

Mr. Curtis discussed the theory of induction heating and explained the manner in which heat is inductively produced in metal parts. He also discussed various applications of hardening, brazing, and soldering in some detail, both from the standpoint of tool engineering and economical production. He illustrated his talk with a color film.

Hamilton: Harold B. Chambers, metallurgist of Atlas Steels, Ltd., Welland, Ontario, was principal technical speaker at the meeting held October 8 at the Royal Connaught Hotel.

Mr. Chambers discussed the relationships of different types of tool steels to tool design. His talk was accompanied by the showing of a new Atlas sound and color film entitled "A Vision Fulfilled".

Attendance at the dinner was 82, with approximately 110 persons attending the technical session.

Hartford: J. H. Aiken of Stevenson, Jordan & Harrison, Inc., management engineers, was principal technical speaker at the October 4 meeting held at The City Club. His topic was "Job Evaluation".

He gave a short general talk, outlining job evaluation approaches to meet requirements of the War Labor Regulations Board and the Treasury Department. He made a particular point of distinguishing four phases: job description; employee rating; management committee to check the factors involved, and the final bargaining of rates.

Kansas City: Principal speaker at the October 6 meeting held in Fred Har-

(Continued on page 224)

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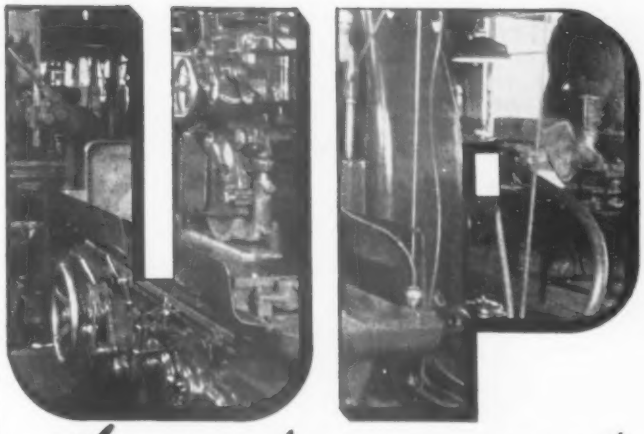

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vey's Pine Room at Union Station was C. Earl Hovey, patent attorney who spoke on "The Humorous Side of a Serious Business".

Vernon Peterson of the Northeast Tool & Die Works of Kansas City presided at the technical session. James E. Bell, Jr. was elected secretary to succeed Wm. Howard Lebo, who is now an ensign in the Navy.

Los Angeles: Julian Hinds, general manager, district offices, metropolitan water works, was the coffee speaker at the October 14 meeting.

At the technical session, Moore Machinery Co. showed moving pictures of the Bliss hydraulic press. The film showed particular uses and installations of the machine. Also on the program was a movie depicting actual operation of Gisholt turret lathes.

Milwaukee: W. H. McCoy, general master mechanic, aircraft engine division, Packard Motor Car Co., addressed the technical session held Oct. 14 at the Hotel Astor. He talked on "Tooling and Production of the Rolls Royce (Merlin) Engine".

In his discussion he pointed out the difficulties of converting English drawings into American standards and contrasted the time required to produce the present Rolls engine in comparison with production time of the Liberty engine of World War I. He stressed particularly the improvement made in tooling, number of drawings made, and degree of finish of the engine.

New Haven: "Factors To Be Considered in Reducing Tool Failures" was the technical subject discussed at the October 14 meeting held at Hotel Duncan.

Leonard C. Grimshaw, metallurgist and Ray P. Kells, service engineer, both representing the Latrobe Electric Steel Co., were the technical speakers. They discussed the means available for spotting the causes of premature tool failures and the corrective methods being used. Starting with the tool or die taken out of the production line, they worked back to such factors as grinding, heat treatment and design.

New Orleans: This new chapter now has 83 members and is conducting an active campaign to enlarge the membership.

Ray H. Morris, national A.S.T.E. president, attended the second meeting of the chapter on September 29 at Jax taproom, New Orleans. He presented the chapter with an official charter and swore in chapter officers. A series of technical meetings is being planned by the officers and will soon be inaugurated on a regular monthly basis.

Philadelphia: Adam Gabriel, Acme Industrial Company, Chicago, was technical speaker at the October 21 meeting held at the Engineers Club. The subject was "Measurements by Light Rays".

At the business session T. W. Frankfurter, Sr. presented a report on the Indianapolis semi-annual meeting. Also on the program were three moving pictures "Target For Tonight," "Long Distance," and "Russia Fights Back" furnished by the Bell Telephone Co.

Pittsburgh: James P. Gill, chief metallurgist for the Vanadium Alloys Steel Co., Anchor Dawn Steel Co., and Colonial Steel Co., addressed the regular monthly meeting held at Hotel Henry, Oct. 1. He discussed some of the characteristics of standard types of tool steels.

Mr. Gill is the past president of the American Society for Metals and is a contributor to the technical press on tool steel subjects. Included among the guests at the meeting were Dr. Dau Tung Wu and two assistants who are in this country to study the tool steel industry on behalf of the National Resources Commission of the Chinese Government.

Potomac: Approximately 162 persons attended the October 7 meeting held at the Mayflower Hotel.

Technical speaker was A. H. d'Arcambal, vice president of the Pratt-Whitney Division of Niles-Bement-Pond Co., and former national A.S.T.E. president. He spoke on "Precision Cutting Tools and Gages," using slides to illustrate his talk.

Also on the program was a film, "Planes of the Navy," produced by March of Time.

Racine: Dinner speaker at the September 18 meeting was W. D. Stanfil, secre-

(Continued on page 226)

AUTHORITIES RECOMMEND

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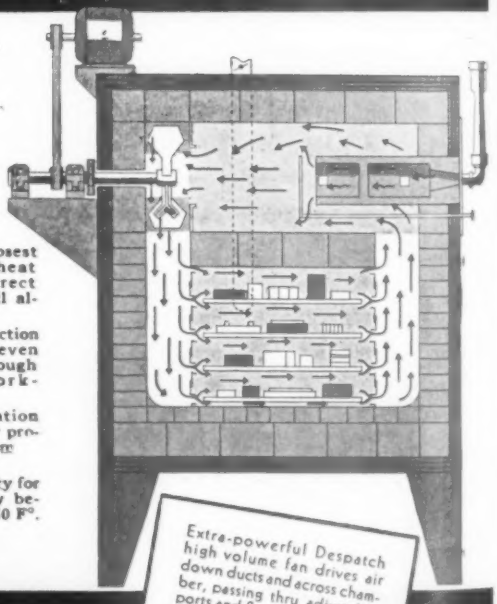

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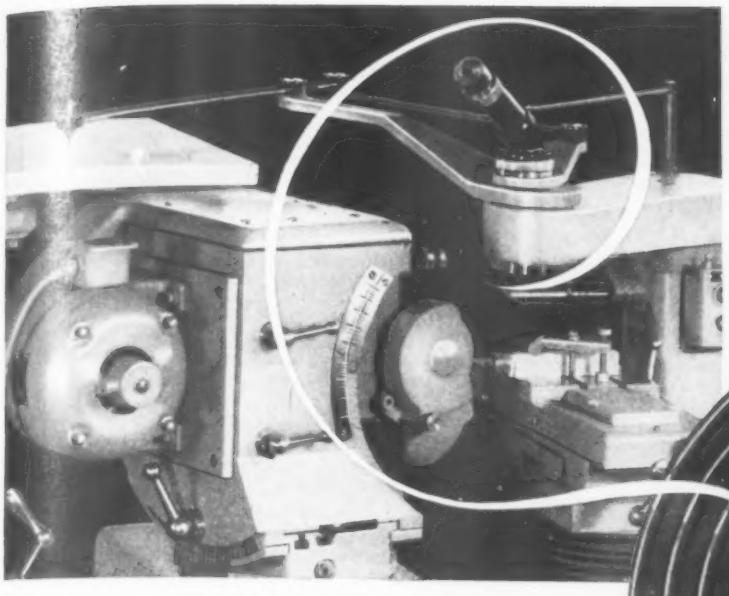

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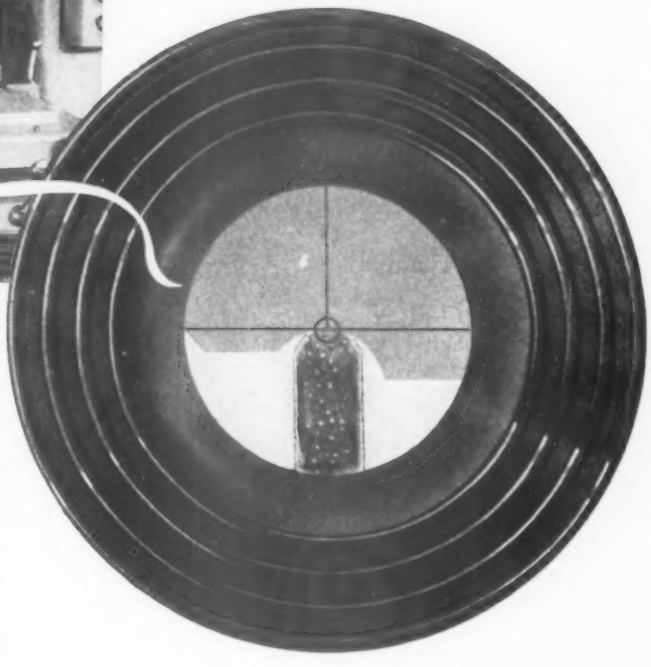

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The cross hairs in the optical center of the 30 power microscope are focused on the work and grinding wheel. The intersection of these cross hairs corresponds to the position of the pantograph pointer on a 50 times size layout of the profile to be ground.

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Innumerable forms can be ground on this machine in any material including tungsten-carbide. Accuracy can be held to .0005" and on occasions even closer. WRITE FOR FULL DETAILS.

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(With Round or Square Head Gaging Buttons)

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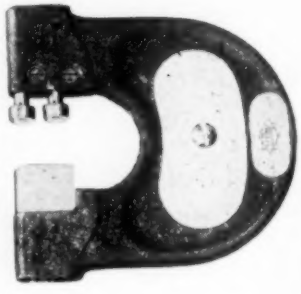
Available in Sizes from: .000 to .760



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Odd and irregular shaped work may be easily and accurately checked with a Quality "Kwik-Chek" Midget Gage. Note the extension of the anvil which allows proper lining up of work before presenting it to the gaging buttons. Provides real speed-up of hand checking.

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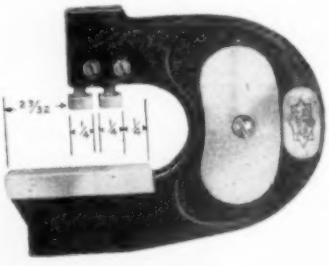

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tary of the Racine Manufacturers' Association.

At the technical session W. H. Oldacre, president of the D. A. Stuart Oil Co., Chicago, spoke on "Cutting Fluids as Factors in Tool Design."

At the October 18 meeting Dr. H. B. Osborn, Jr., representing the Ohio Crankshaft Co., Cleveland, discussed the Tocco process of induction heating surface hardening, and its contribution to the war effort. Also included on this program was a sound motion picture entitled "Bridging San Francisco Bay".

Rochester: Technical speakers at the October 12 meeting, attended by approximately 175 members and guests, were Richard and Robert Moore, brothers and co-owners of the Moore Special Tool Co. They spoke on "Precision Tool and Die Making" and "Precision Machine Tools".

High lights of the technical session concerned manufacturing of precision lead screws on jig boring and grinding machines, as well as dies and gages built for producing M43 anti-aircraft shell fuses.

Also included on the program was an illustrated talk on "Freak Patents", by W. J. Soley, patent attorney for the Carborundum Company.

Rockford: Gilbert D. Stewart, chief engineer of Ex-Cell-O Corporation's machine tool division was principal technical speaker at the meeting held Oct. 7 at the Faust hotel. He discussed modern thread grinding methods.

Also on the program was a talk on activitites of the Allied Military Government of Occupied Territory by Lt. Phillip Plachinsky, Camp Grant officer.

He discussed the three phases of occupational government—restoration of communications and facilities immediately behind the combat lines, maintenance of order after the combat forces have advanced, and education.

Springfield: Speaking on "Research as a Tool of Post War Planning," Maurice Holland stressed the importance of company officials as well as technical personnel in future industrial development at the technical session of the September 13 meeting at the Hotel Highland. Attendance at the meeting was 113 members and guests.

Another feature of the program was the showing of the motion picture, "Target For Tonight," an R.A.F. action picture released by the British Ministry of Information.

St. Louis: Approximately 137 members and guests attended the October 7 meeting held at the Melbourne Hotel.

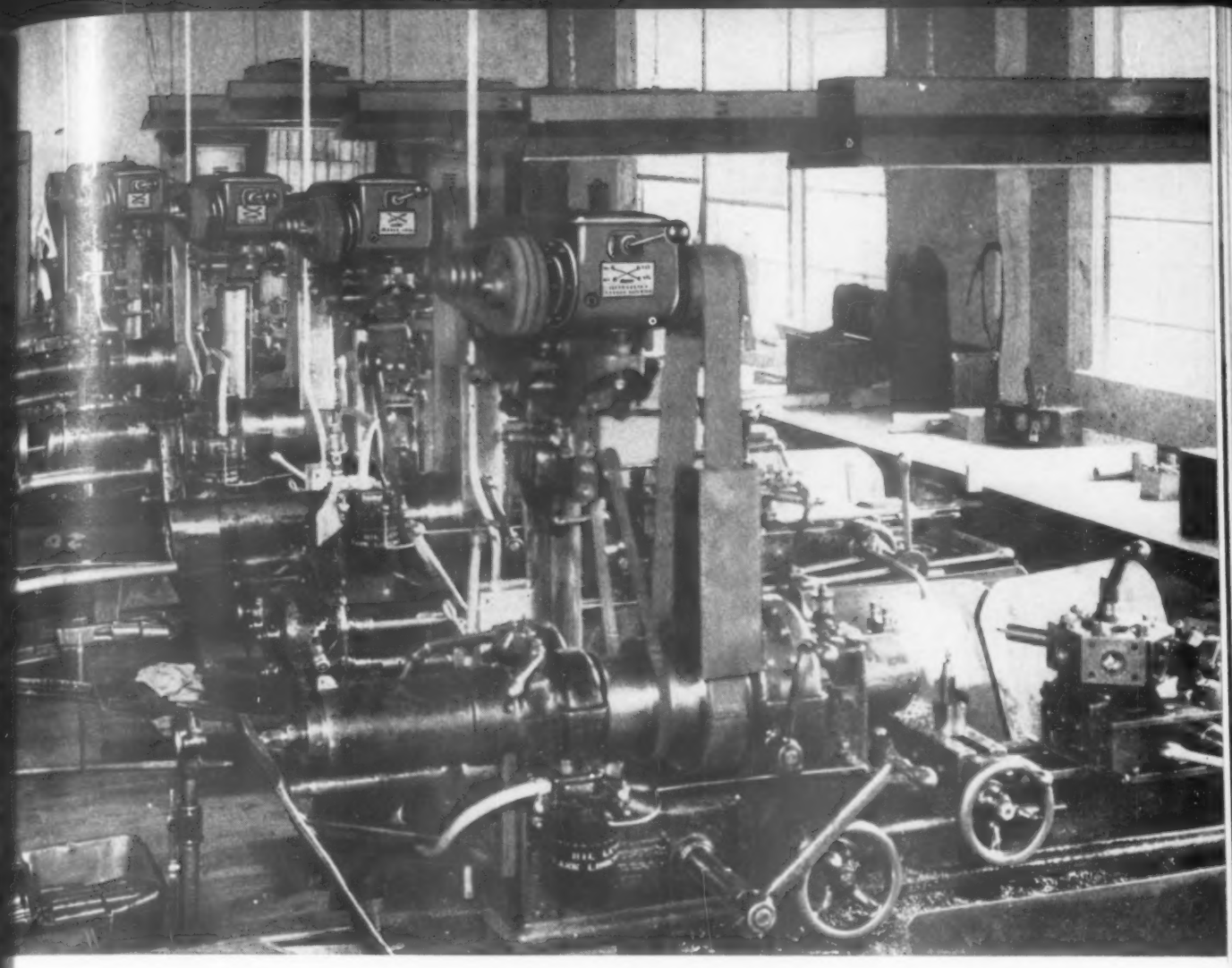
R. S. Drummond, representing National Broach & Machine Company, presented a discussion on spur and helical gears at the technical session.

The entertainment committee is now working on plans for a "Wing-ding" Christmas party.

Toledo: The chapter held a past chairman's dinner on September 15 at the Toledo Yacht Club.

Earl V. Johnson, national A.S.T.E. secretary presented Otto W. Winter, Arthur Bok, Lorence E. Rennell, Lloyd A. Kelley, and Walter L. Ulrich with

(Continued on page 228)



. . . as many as 350 in one plant

Hundreds of plants throughout the country motorize their machine tools with Western Transmissions . . . one Detroit plant has more than three hundred and fifty turret lathes so equipped.

The Western MASTER (1-5 h.p.) transmission including standard bracket f.o.b., Detroit, $95.00.

The Western MAJOR (5-10 h.p.) transmission including standard bracket f.o.b., Detroit, $145.00.

Western SUPER (up to 30 h.p.) with 8 SPEED CHANGES in Geometric Progression of 1.29 (total reduction of 6 to 1) . . . For Machine Tools, Rubber Mills, Steel Mills, Baking Machinery, etc. Services of our engineering department are at your disposal . . . Send for new four-page catalog. Prompt deliveries on high priorities.

Battery of turret lathes motorized with Western Transmissions in the modern plant of Scully-Jones and Company, Chicago, U. S. A. Photograph the courtesy of Scully-Jones and Co.

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For Motorizing Lathes, Milling Machines, Shapers, Turret Lathes, Radial Drills, Slotters, Bolt Cutters, Gear Cutters, Die Sinkers, Boring Mills, etc.

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traditional past chairman's pins in recognition of services rendered to the chapter during their respective tenures of office.

Principal speaker on the program was Burnham Finney, editor and publisher of "The American Machinist". He spoke on "Industry Goes To War." He pointed out that top production now would save many lives later and cited production figures to show that in World War I only 12,000 airplanes of 23,000 ordered ever reached the front lines.

Toronto: Approximately eighty persons attended the September 17 meeting held at Malloney's Gallery.

Charles Neal, chapter treasurer and manager of Canadian General Electric's Carboloy Division spoke at the technical session on "Cemented Carbides, The Magic Metal." His talk included many illustrations of actual operations in which cutting speed, cut and feed were cited.

The chapter is now making a survey to consider the possibility of holding an expanded series of study courses in tool engineering during the winter. Courses so far suggested are: Aircraft Processes and Methods, Hobs and Broaches, Milling Cutter Control, Pressed Metal Operations, Punch and Die Design, and Time Study and Costing.

Applicants are given a choice of four schools in different sections of the city and courses may be arranged to suit the majority.

Tri-Cities: Approximately 80 persons turned out for the technical talk on "Low Temperature Refrigeration in Industry", presented by Fred Whitcomb, representing Motor Products Corp., Deep Freeze Division, Chicago, at the September 8 meeting at Blackhawk Hotel in Davenport, Iowa. Mr. Whitcomb used slides to illustrate his talk.

Also on the program was an address by Robert A. LeFevre, an officer in the French Army of World War II, who gave a talk, "Fall of France". Ray H. Morris, national A.S.T.E. president also attended the meeting and spoke briefly.

General Mills Mechanical Manufacturing Division played host to the Twin City A.S.T.E. chapter at its first Fall meeting, held Sept. 22.

C. G. Becker, left, engineering division manager, and G. Widen, right, chief tool engineer, greet F. Gruber, chapter chairman, center, at the assembly display.

Twin City: The first Fall meeting of the Twin City Chapter was held at General Mills Mechanical Manufacturing Division plant Sept. 22.

Following dinner in the plant cafeteria E. W. Dickett, A.S.T.E. regional director, gave an interesting comparison of problems confronting tool engineers of the Rockford and Twin City areas. During the business meeting L. Felten and D. Coacher of the tool engineering department of General Mills spoke on tooling and methods problems.

(Concluded on page 230)

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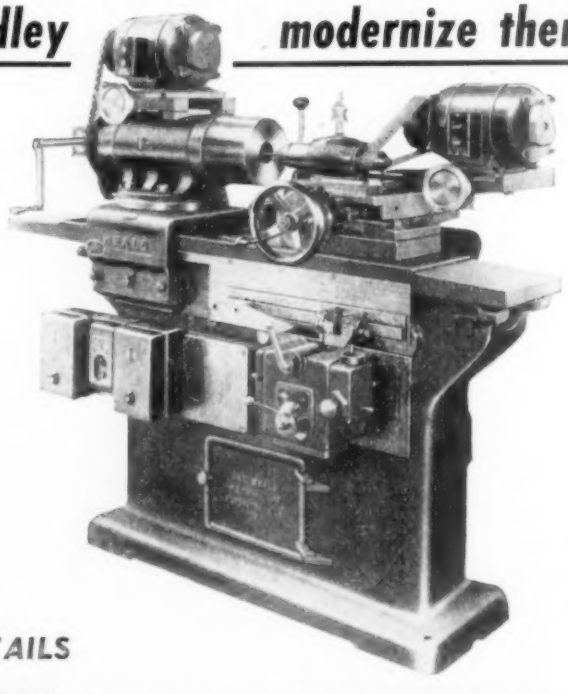

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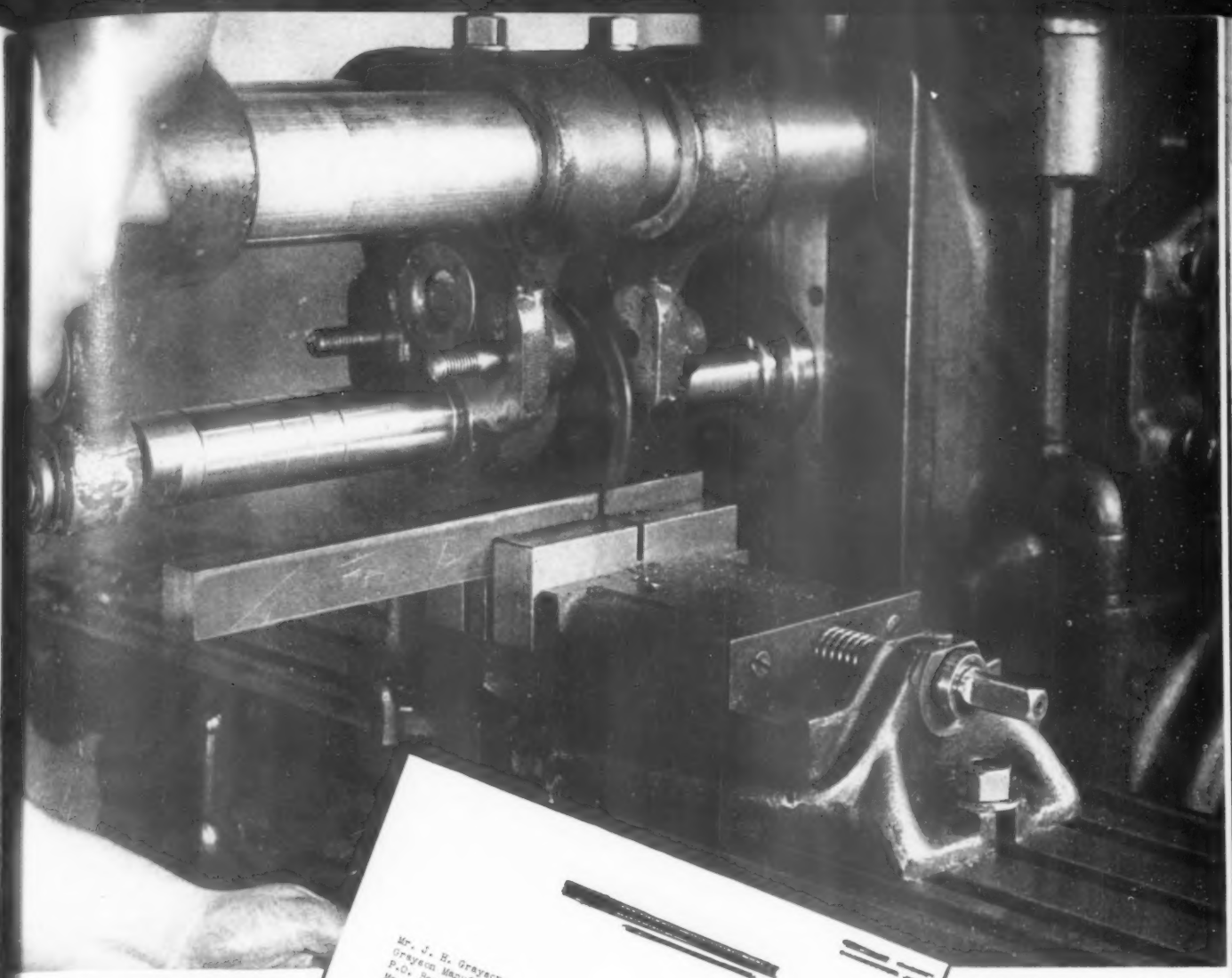
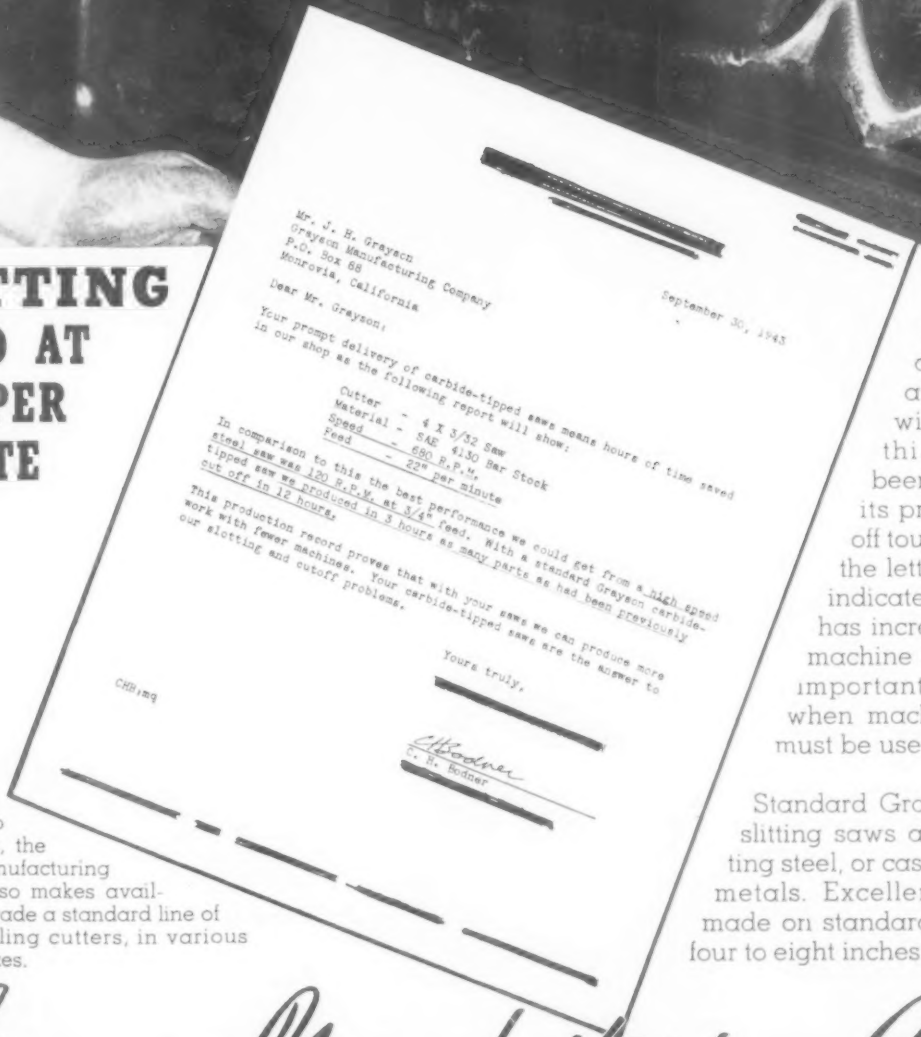


SLITTING 4130 AT 22" PER MINUTE !



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Dear Mr. Grayson:

Your prompt delivery of carbide-tipped saws means hours of time saved in our shop as the following report will show:

Cutter - 4 X 3/32 Saw
Material - SAE 4130 Bar Stock
Speed - 680 R.P.M.
Feed - 22" per minute

In comparison to this the best performance we could get from a high speed steel saw was 130 R.P.M. at 3/4" feed. With a standard Grayson carbide-tipped saw we produced in 3 hours as many parts as had been previously cut off in 12 hours.

This production record proves that with your saws we can produce more work with fewer machines. Your carbide-tipped saws are the answer to our slotting and cutoff problems.

Yours truly,

C. H. Bodner

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WITH A FEED RATE OF 22" PER MINUTE (as against a maximum performance of 3/4" per minute with high speed steel), this aircraft firm has been able to quadruple its production in cutting off tough 4130 bar stock. As the letter reproduced here indicates, this performance has increased the output per machine immensely, a vitally important fact in these times when machines and operators must be used to the utmost.

Standard Grayson carbide-tipped slitting saws are available for cutting steel, or cast iron and nonferrous metals. Excellent deliveries can be made on standard saws ranging from four to eight inches in diameter.

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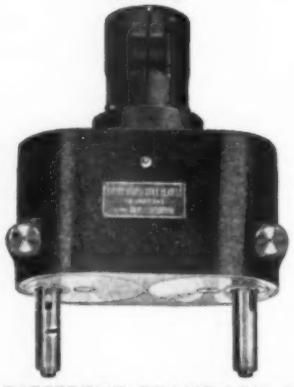

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—— A.S.T.E. DOINGS ——

Following the meeting members were taken on a tour of the plant. Seventeen special stations were visited including jig and fixtures displays, special testing and gaging equipment, instrument gear cutting and shaving equipment, and numerous part and assembly displays.

Western Michigan: Technical speaker at the first 1943-1944 meeting held Sept. 13 at Park Church, was Albert G. Mather, president of DoAll Midwest Company. He spoke on "The Continental Process for Making Short Runs of Metal Stampings".

In his talk, which was illustrated with motion pictures, Mr. Mather outlined and illustrated the economical method of constructing and operating dies for sheet metal. He pointed out that such dies are cheap and satisfactory for short runs where the cost of conventional dies are too great when amortized over small quantities. In many cases the dies are made of stress relieved cold, rolled steel, case hardened.

Mr. Mather also addressed the October meeting, speaking on "The Theory, Care, Application, and Use of Gage Blocks." He used a series of color slides to illustrate his talk.

Worcester: Approximately 120 persons attended the technical session held October 5. During the dinner preceding the meeting, Leon Felton spoke on "The Golden Rule" and Ray Morris, national A.S.T.E. president discussed proposed recommendations to be taken up at the national meeting in Indianapolis.

The technical talk of the program was given by Bradford Reed of the Rolled Thread Die Company, Worcester. He discussed rolled thread dies, illustrating his address with slides. Also on the program was a talk by Mr. Hart of the Goodrich Company who showed a movie relating to the manufacture and development of rubber.

* * *

NOVEMBER MEETINGS

Detroit—Nov. 11, Auditorium, Horace H. Rackham Memorial Building. Rear Admiral Downes, Commandant of the 9th Naval district will talk on "Tool Engineers and Their Contribution Toward Winning the Present War."

Milwaukee: Nov. 11, Hotel Astor.

Montreal: Nov. 10 A. E. Rylander, technical editor of The Tool Engineer and author of the "Handy Andy" column, will give a general "Handy Andy" talk.

New Haven: Nov. 11, Hotel Duncan. E. V. Flanders of Jones and Lamson Machine Co. will address the group on "Modern Development of Thread Grinding Practice."

Rockford: Nov. 10. Speaker will be Maj. Alexander P. de Seversky, author of the best-seller, "Victory Through Air Power."

Syracuse: Nov. 9, Hotel Syracuse, R. S. Drummond, president of National Broach and Machine Co. will speak on modern methods of gear manufacturing.

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The Most Complete and Up-to-the-Minute Line of Modern Time-Saving Clamps

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Screws, Swivels and Handles COPPER PLATED against Welding Spatter

QUIKCET for fast (4-second) Clamping — Instant ratchet set and release, fulcrum screw tightening, 1-hand operation and a non-creeping grip even on irregular surfaces. Setting the pace in war production.

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DUAL GRIP — Double action malleable clamps. Side tightening for close working conditions. No twisting or creeping.

WELDERS' GROUND CLAMP. Completely copper plated, with connection for ground wire.

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HEAVY DUTY SPEED CLAMPS. 2-handed, lever locking and instant release. Also Giant 10½" opening size.

QUICK LOCKCET — For light fast work. Locking lever gib seat and instant trigger release.

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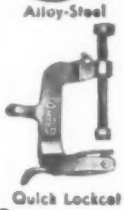

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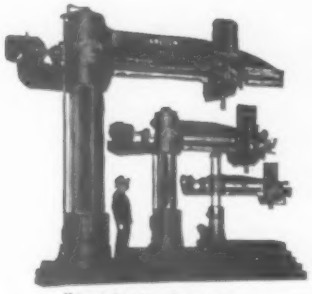
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LOOK! Hammond's **NEW 10" and 14"**

Provide many improvements over previous models: cup wheel safety discs — free flowing, fully adjustable coolant spouts — and splash pans. Under all conditions No spray-No splash grinding is assured. "You're dry when you grind wet!"

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THE EVER-CHANGING SCENE IN MASS MANUFACTURING

Joseph W. Frazer, president and general manager of Willys Overland, has resigned after five years service as head of the organization, according to a company announcement.

He headed the company during the conversion program from peacetime products to 100% war production of such material as jeeps, artillery shells, aircraft sub-assemblies, aluminum forgings, gun parts and other armaments.

Mr. Frazer was vice-president and general sales manager at Chrysler Corporation before going to Willys in 1939. He previously had been associated with Chevrolet, Pierce-Arrow, and Maxwell.

Also announced by Willys is the appointment of Van S. Wielosinski as plant metallurgist. He was associated with Carnegie-Illinois Steel Corp. at Chicago for seven years prior to joining the Willys staff.

Mack Manufacturing Corp., announces appointment of **A. N. Morton** as vice-president and director. He will retain his position as production manager of Mack factories in Plainfield and New Brunswick, N. J., and Allentown, Pa., which he has held since last February.

A. N. Morton

Bliss & Laughlin, Inc., Harvey, Illinois, announces the appointment of two engineers to its staff.

Harry M. Clarke, associated for the past nine years with the Carnegie Illinois Steel Corporation, has been named metallurgical engineer. He is a graduate of the University of Wisconsin.

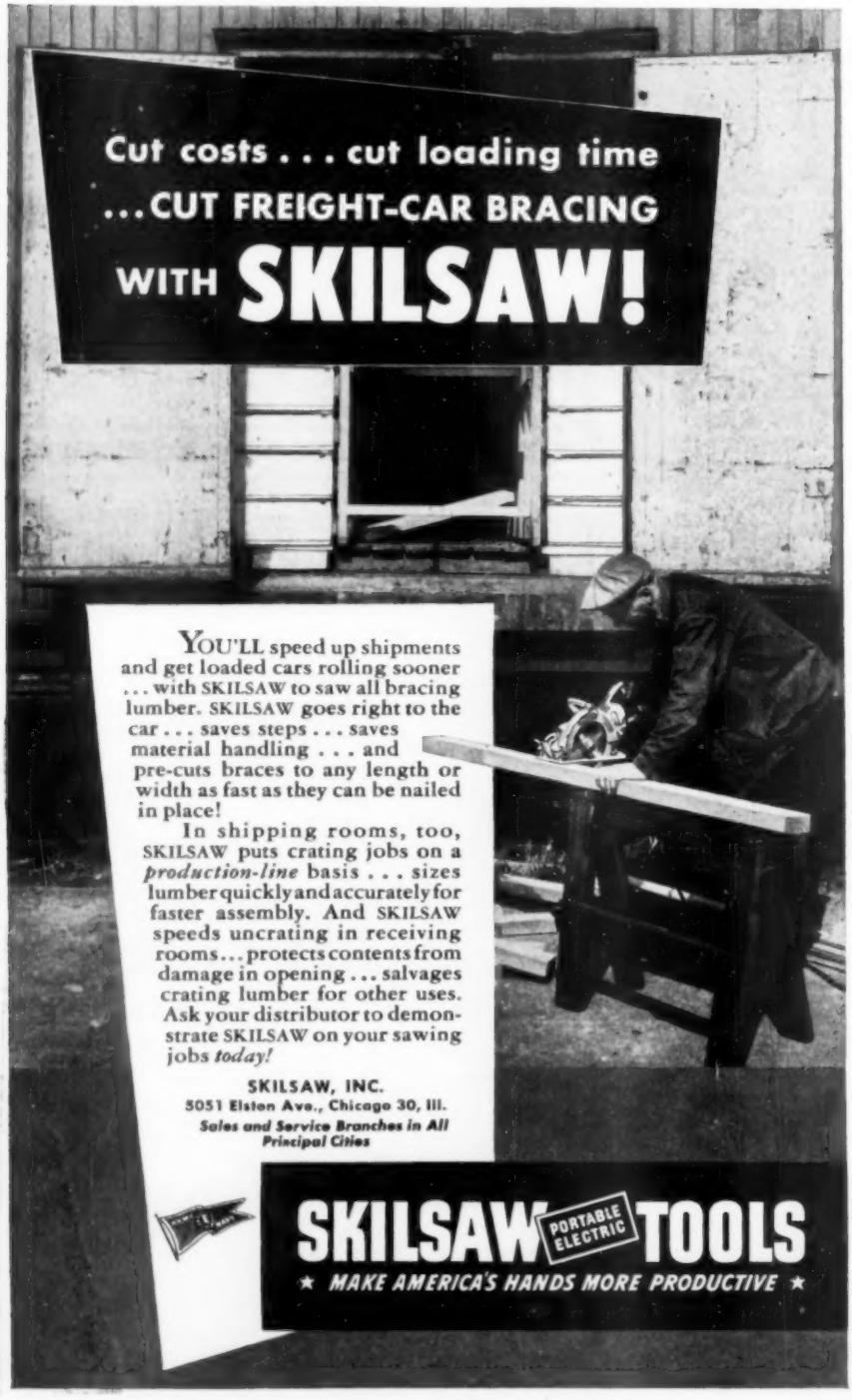
New mechanical engineer for the company is **Karle D. Meyer.** He will serve both the western plant in Harvey, Illinois, and the eastern plant at Buffalo, New York. A graduate of Cornell University, he formerly was associated with the Peoples Gas, Light and Coke Company as mechanical engineer.

Dorothy M. J. Tracey, has been appointed general manager of Tomkins-Johnson Company, Jackson, Michigan, according to **A. R. Johnson,** president.

Dorothy M. J. Tracey

Mrs. Tracey, who also holds the post of vice-president, was purchasing agent for the company for several years, prior to 1939. In her new capacity, she suc-

(Continued on page 222)


Cut costs . . . cut loading time
. . . CUT FREIGHT-CAR BRACING
WITH SKILSAW!
YOU'LL speed up shipments and get loaded cars rolling sooner . . . with SKILSAW to saw all bracing lumber. SKILSAW goes right to the car . . . saves steps . . . saves material handling . . . and pre-cuts braces to any length or width as fast as they can be nailed in place!
In shipping rooms, too, SKILSAW puts crating jobs on a production-line basis . . . sizes lumber quickly and accurately for faster assembly. And SKILSAW speeds uncrating in receiving rooms . . . protects contents from damage in opening . . . salvages crating lumber for other uses. Ask your distributor to demonstrate SKILSAW on your sawing jobs today!
SKILSAW, INC.
5051 Elston Ave., Chicago 30, Ill.
Sales and Service Branches in All Principal Cities
SKILSAW PORTABLE ELECTRIC TOOLS
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

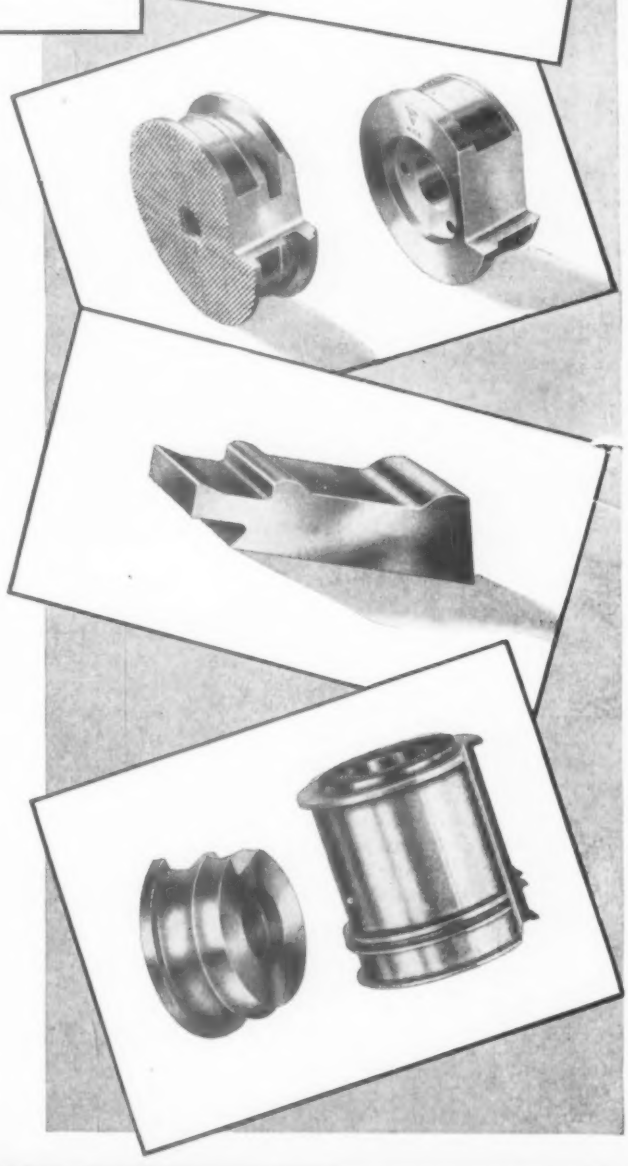
PRODUCED *Exactly* TO YOUR SPECIFICATIONS

MORSE TOOL COMPANY'S

High Speed Steel

FLAT AND CIRCULAR

FORM TOOLS



Illustrated are only a few of the innumerable types of flat and circular tools manufactured by Morse Tool Company. All of these tools are produced with strict adherence to the tool design, dimensions and tolerances required for the specific jobs on which they are used. In all cases, the finest high speed steels are used to assure long life and lasting accuracy.

Morse Tool Company has been producing form tools for more than 22 years. The experience, ability and facilities built up over this period are yours to draw on . . . to help in your present War Production program . . . to lay the foundation for efficient, economical cutting operations in your post-war production.

Morse Tool Company's standard lines of tools include counterbores, countersinks, core drills, holders, and pilots. Among the company's special tools are milling cutters, gang mills and arbors, form relieved cutters, reamers and many types of built-up tools.

Morse Tool Company 116 E. GOLDENGATE ST.
DETROIT • MICHIGAN

ceeds Mr. Johnson who will devote his time to broader problems of manufacturing and sales.

Appointment of **Delos M. Palmer**, dean of engineering at the University of Toledo since 1934, as plant engineer at the American Propeller Corp., Toledo subsidiary of the Aviation Corporation, has been announced by the Corporation.

Also reported by the corporation is the appointment of **William M. Stabler** as service manager of American Propeller. He formerly was service manager of the liquid-cooled engine division.

Aro Equipment Corp., Bryan, Ohio, announces that **R. W. Morrison**, manager of the corporation's industrial pneumatic tool division, has been appointed to the War Production Board as a member of the Portable Pneumatic Tool Industry Advisory Committee. Mr. Morrison is well known in the pneumatic tool field and has had many years experience as an engineer and sales representative.

Walter Zietz, factory representative for Moline Tool Co. since 1937, died Oct. 7 at Wilmington, Delaware. He was instrumental in founding the Tri-Cities A.S.T.E. chapter.

New manager of Engineering and Research for Denison Engineering Co., Columbus, Ohio is **R. C. Griffith**, for-

R. C. Griffith

merly of the engineering, sales, and aircraft departments of Vickers, Inc.

A graduate of the University of Michigan, he is well known in the machine and tool design fields and in the oil hydraulics industry.

W. H. Richardson has been appointed by Timken Roller Bearing Co. as general manager of all activities of all divisions on the West Coast and in the Orient, according to information from the company.

He has been a Timken employee since 1917, serving in various capacities, his last previous position being assistant general sales manager. He recently has been active in surveying the post-war market.

G. R. Marshall & Co. has announced that **Fred Schytte** has joined its staff as sales and consulting engineer, with

Fred Schytte

headquarters in Toronto. Mr. Schytte is chairman of the Toronto Chapter of American Society of Tool Engineers.

Died: **Frank L. Odenbreit**, managing-partner of Mechanical Specialties Company, Los Angeles, California, on September 11. He was a member of the Los Angeles Chapter of the American Society of Tool Engineers.

Irving B. Babcock has been made vice-president of General Motors Corporation. He also has been appointed general manager of the newly created GMC Truck & Coach Division of the General Motors, which is taking over the business formerly conducted by the Yellow Truck & Coach Manufacturing Company. Mr. Babcock had been head of the latter company.

(Concluded on page 240)

A portable combination pump unit, consisting of a fuel pump and bilge pump. Pumps fuel into aircraft tank and removes bilge water from seaplane body. Bilge pump in foreground.

Corrosion Resistant!

Bilge-pump bodies of AMPCO METAL resist salt water — *have longer life*

The corrosive action of salt-laden bilge water calls for the use of a corrosion-resistant metal in bilge pumps used by many U. S. Navy seaplanes. Longer life and maximum service are assured through the use of Ampco Metal, as this alloy of the aluminum bronze class has splendid corrosion-resistant properties.

You may need an acid- and corrosion-resistant material which has — coupled with these properties — high tensile strength and excellent wear-resistance. The remarkable physical properties of "Ampco" bronzes lend themselves to many applications where unusual service is required which will affect length of life, economy, and, in many cases, operating safety.

When you need bronze parts to stand up against corrosion, wear, or metal fatigue, investigate Ampco Metal. Send for free booklet, "File 41—Engineering Data Sheets."

ARMY E NAVY

AMPCO METAL, INC.

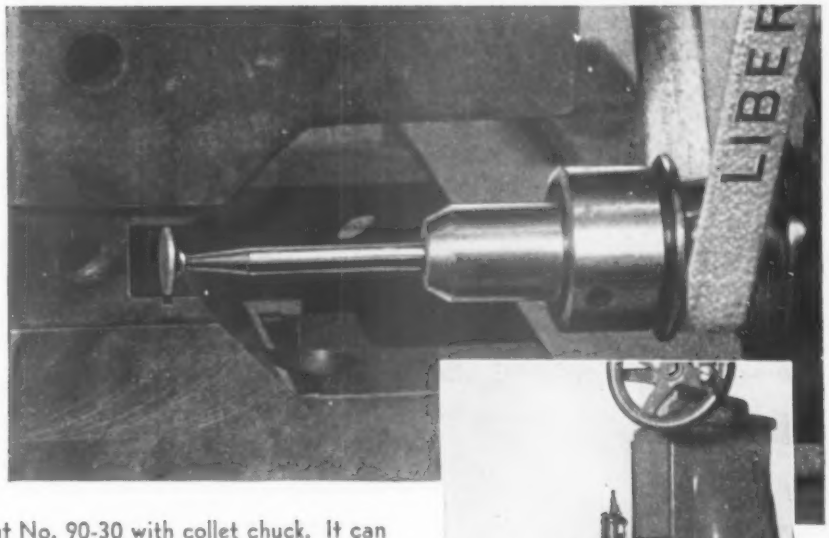
DEPARTMENT TE-11 MILWAUKEE 4, WISCONSIN

AMPCO METAL

AMPCO

THE METAL WITHOUT AN EQUAL

Liberty Attachments



Grinding a Difficult Keyway

This is Liberty Horizontal attachment No. 90-30 with collet chuck. It can be assembled to your surface grinder in 2 minutes without machining. It will do many intricate jobs which are otherwise impossible without this grinding attachment. The illustration shows the grinding of an inaccessible keyway. Liberty Attachments are available in Horizontal and Vertical models. They are adapted for use on many popular surface grinders. Can be had with solid quill or collet chuck. Hundreds of plants find them indispensable.

Send for Circular

LIBERTY TOOL & GAGE WORKS, INC.

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Tomorrow's Tools for Today's Tasks

NEED SPROCKETS *fast?*

ORDER FROM CULLMAN

There is no time to experiment when you need sprockets for essential war work.

Cullman Wheel Company carries more than 50,000 sprockets in stock---and can make them to your specifications quickly and economically. When you order Cullman Sprockets, you get the benefit of specialized equipment and experience---with consequent savings.

Write for booklet giving necessary information for sprocket users.

CULLMAN WHEEL CO.

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Fight WITH WAR BONDS

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ARE TOPS ON THE PRODUCTION FRONT

TOPS is the Word for Producto Service on Die Sets and Die Makers' Accessories from Bridgeport, Detroit, Cleveland and Los Angeles.

Enlarged facilities at the above assembly plants assure prompt shipment today on catalog items.

Special Die Sets can be shipped without delay from Bridgeport or Detroit.

CAM LOCK VISE

Dependable and Tough! So say operators in war plants where thousands of Producto Cam Lock Vises are used on milling and drilling operations for producing machine guns, rifles, pistols and carbines.

These Vises made in 3 sizes — 4", 5" and 7" — are the best production vises for hard wear. Positive clamping and quick acting.

Ask for Producto circulars for complete line of all types of Vises.

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SENSITIVE
TAPPING MACHINES
give better results

Special design, improved dry-clutch and precision workmanship make Procunier Tapping Machines *so sensitive* that even unskilled operators can detect an overloaded or dull tap —or determine instantly when tap hits bottom of hole. That means greatly decreased tap breakage. Other features of Procunier design that assure faster, more accurate tapping are: The extra-long spiral compensating springs, with wide range of hand screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF THE OPERATOR; Four speeds, ranging from 390 to 2050 RPM efficiently handle jobs for which conventional high speed tapping machines are inadequate; One machine handles tap sizes from No. 2 to ½" through two interchangeable heads.

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For Faster, More Accurate Tapping

Procunier Safety Chuck Co.
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Send me bulletins on:

- ☐ Universal Tapping Machines
- ☐ High Speed Tapping Heads
- ☐ Tru-Grip Tap Holder

Name .....

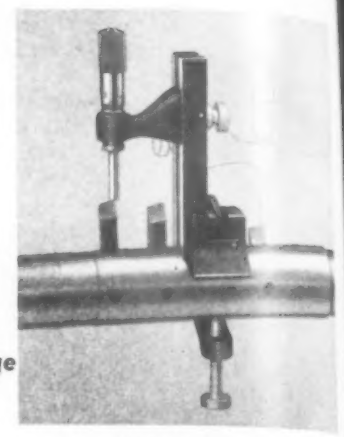
Address .....

City ..... State .....

MAIL THIS COUPON TODAY

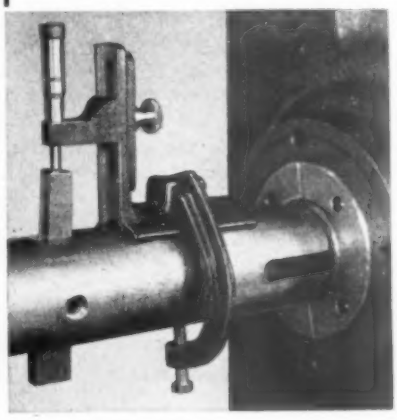
BARTELT
Pedestal Micrometers

formerly called
Bartelt
Tool Setting Gage



MODEL "B" ↑

↓ MODEL "A"



★ These handy, practical gages will speed up boring machine work and help to produce accurate results more easily. Inexperienced hands are aided toward becoming good workmen more quickly. Available in two models, as shown. Three clamps furnished, to fit all boring bars from 1" to 5" diameter.

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Engineering Company
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Stuart's Thred Kut SOLVOL "Super-Kool" CODOL

Begin with **the Finest Cutting Fluids...**

THEN APPLY THEM PROPERLY . . .

● Anything less than the best cutting fluids available is a handicap to your production. Equally important is *proper application.* Stuart Oil Products and Stuart Oil Engineering will give all the advantages it is possible to get from cutting fluids.

For All Cutting Fluid Problems

D. A. STUART OIL CO.

Chicago, U.S.A. • LIMITED • Est. 1865

Warehouses in All Principal Metal Working Centers

Faster, Better DE-BURRING, FINISHING, POLISHING . . . *in Fewer Operations*

Brightboy offers you outstanding time and work savings, plus quality, precision finish, because it is made of *resilient rubber*. The rubber is *impregnated throughout* with the abrasive. In use, the abrasive recedes slightly into the rubber, cushioning the abrasive action. Degree of finish is achieved by regulating the machine speed, or in manual operations by the hand pressure. Brightboy's versatility and simplicity eliminate many in-between operations; a Brightboy finish frequently serves as a final polish.

Ask your distributor for Methods and Applications Data, catalogs and prices. Brightboy field representatives are at your service.

BRIGHTBOY INDUSTRIAL DIV.
WELDON ROBERTS RUBBER CO.
Newark, N. J.

WELDON ROBERTS
Brightboy

ARMSTRONG

Do the same work with 1/10 the High Speed Steel

Stop wasting critical High Speed Steel by using forged tools for work that can be done more efficiently with a few ARMSTRONG TOOL HOLDERS. Each ounce of high speed steel in an ARMSTRONG TOOL HOLDER will do the work of 10 ounces in a bar tool. With single ARMSTRONG TOOL HOLDERS replacing complete sets of forged tools, the large amounts of high speed steel tied up in cumbersome single-purpose solid tools or wasted in heavy tool stumps can be saved.

ARMSTRONG TOOL HOLDERS are the most efficient tools obtainable, with correct cutting angles, maximum tool clearance, extreme rigidity and strength to stand up to **any** speed or feed. Use them for every operation on lathes, planers, slotters and shapers and for many operations on engine lathes, turret lathes and screw machines to "SAVE: All Forging, 70% Grinding and 90% **High Speed Steel.**"

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HYBCO TAP GRINDERS

Lengthen Tap Life — Salvage Broken Taps
Improve — Increase Production

ALL THE VITAL POINTS

SHARPEN TAPS AFTER CENTER IS DESTROYED

Bench, Floor, Floor Exhaust Models. Capacities: Machine Screw to 1½" Hand Taps. Write for Catalogue.

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IN WAR OR PEACE

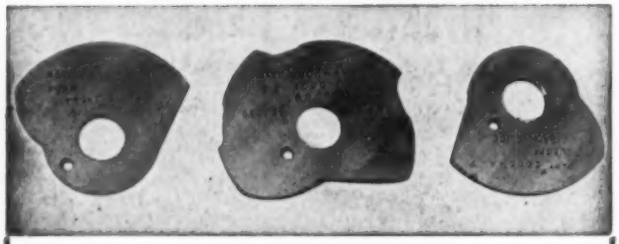
ACME DRILL JIG BUSHINGS

ARE THE GUIDE TO PRECISION DRILLING

★ Here at Acme, we're busy day and night producing drill jig bushings and many other precision items . . . all labeled for "Uncle Sam". And we'll keep right on doing this job for our country until victory is ours and peace comes to the world.

Manufacturers of peacetime products that require accurately drilled holes, are urged to standardize on ACME BUSHINGS to assure the low cost production necessary to meet price competition in the post-war era.

ACME INDUSTRIAL CO.
Makers of Light Wave Measuring Equipment
Telephone: MONroe 4122
208 N. Laflin St. Chicago, Ill.



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for
B & S MACHINES

Cams cut to your layout shipped within 2 to 3 days.

Set of 3 No. 00 Cams including blanks, cutting, heat treating — $6.20 complete. Other sizes in proportion.

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Production UP!
the **GEMCO WAY**

Exclusive!
"LUBRIGARD"
SYSTEM, protects the machine-operator-work piece

GEMCO MULTI PURPOSE **SHAPERS**

Get things done . . .

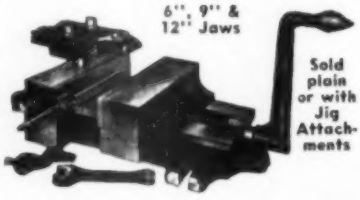
Production to peak machine capacity by operators new to industry . . . that's GEMCO SHAPER Efficiency. Large, easy to read Dials . . . Simple precision Construction . . . Centralized handy control lever operation . . . with Power Rapid Traverse and Power Down-Feed to Tool Head.

Available in Plain, Production, and Universal Types. Up to 24" stroke.

We Deliver—Write for illustrated Bulletin No. G.E. 12-T

GENERAL ENGINEERING & MFG. CO. ST. LOUIS 4, MISSOURI

GRAHAM
MULTI - PURPOSE VISE



In addition to being an extra well designed plain vise (of parallel, flush, four-square construction), this tool also serves an amazing variety of uses as a jig and fixture when used with the numerous Jig Attachments. For miller, drill press, radial, planer, shaper, grinder, etc.

KNURL HOLDER FITTING LATHE TURRET

Adjustable to produce straight, spiral and checkered knurling, with the same pair of straight knurls. Capacity up to 2½" dia. of work. Shank made to fit your turret.

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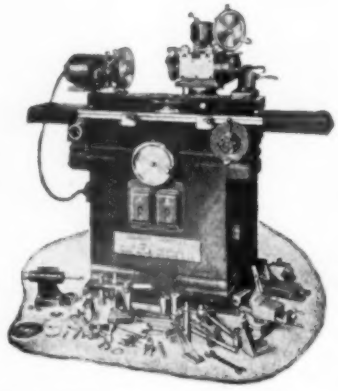
GRAND RAPIDS
NO. 6
UNIVERSAL CUTTER AND TOOL GRINDER



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CABINET BASE
BALL BEARING TABLE
FIXED TABLE HEIGHT

BACKED BY 35 YEARS OF EXPERIENCE IN BUILDING PRECISION GRINDING MACHINES.

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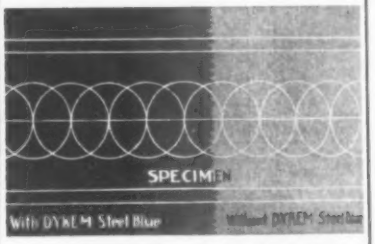
DYKEM STEEL BLUE



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making dies & templates

simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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THE
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2301-D North 11th St., St. Louis, Mo.
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EVANS HIGH SPEED STEEL REAMERS

LOOK AT THESE FEATURES

- Extension pilots for line-up work.
- Cannot fall in slots or oil grooves.
- 35 to 60 thousandths expansion.
- Left and right spirals.
- Full bearing surface.
- Perfect alignment.
- Chrome-like finish.
- Will not chatter.
- No honing.

VICTORY

A PROVEN PRODUCT

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EVANS REAMER AND MACHINE CO.
4539 Ravenswood Ave. Chicago, Ill.

THE IMPROVED NIELSEN LIVE CENTERS

★

Load capacity 200 to 40,000 lbs. at 100 rpm.

Have adjustment to take up wear and preload bearings.

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Standard Morse Taper No. 2 to 6 in stock

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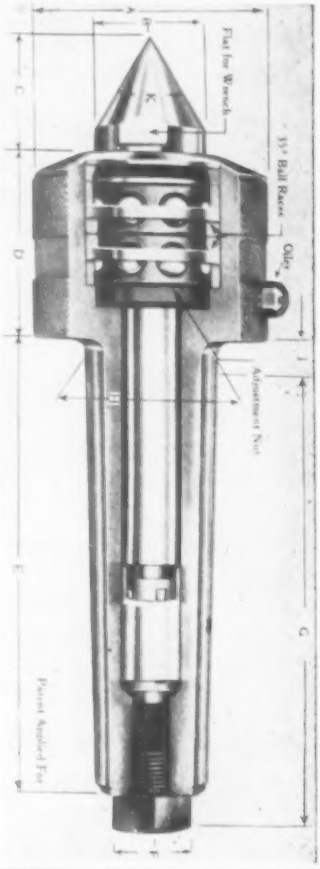
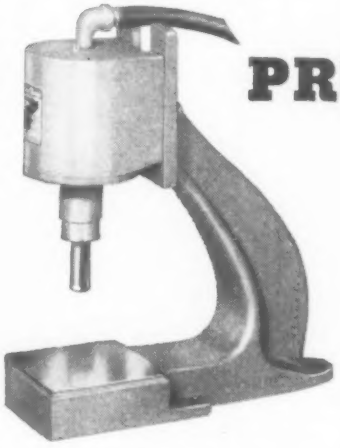
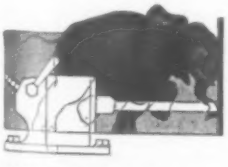


NIELSEN INCORPORATED
LAWTON • MICH.

MEAD Presents the AIR PRESS



The new Mead Air Press delivers 400 lbs. pressure on 100 lbs., line pressure. Handles many staking, crimping, assembly, and similar operations. Stroke of ram adjustable from 0" to 2". Maximum clearance 4". With foot control this press will speed up countless bench jobs, save muscular effort. Write for new, AIR POWER Catalog—just off the press.



MEAD SPECIALTIES COMPANY
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DEPT. 113-TAP • CHICAGO 6, U.S.A.

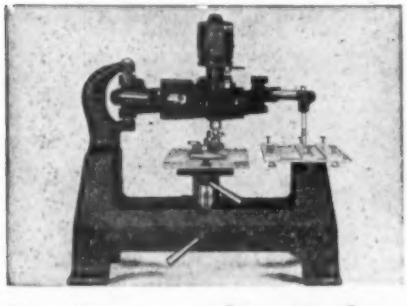
SCHAUER SPEED LATHES

- Meet stepped-up production schedules by employing SCHAUER SPEED LATHES for the final finishing operations on small metal and plastic parts.
- Speed, accuracy, continuous, trouble-free operation make SCHAUER SPEED LATHES production necessities in every plant. A size and type for every purpose. Write for Catalog 420.

SCHAUER MACHINE COMPANY
"Originators of Today's Speed Lathes"
2066 Reading Road • Cincinnati, Ohio

WE are enjoying the flattery of being imitated. One is even using a name so similar to ours as to be confusing to a few customers.

NATIONAL TOOL SALVAGE CO.
6511 Epworth Blvd.
Detroit 10, Mich.



For Pantographic Marking
ENGRAVING
ACID ETCHING
ELECTRIC ETCHING
This machine does all three

A compact precision bench-type pantographic machine, with interchangeable heads . . . for engraving instrument dials, name plates, etc. . . . and for acid etching or electrically marking tools and parts—heat-treated or annealed—on flat, concave, or convex surfaces.

Illustration shows machine with engraving head attached.

Write for Literature

H. P. PREIS ENGRAVING MACHINE CO.
1810 SUMMIT ST. NEWARK 4, NEW JERSEY

—PASSING PARADE—

(Concluded from page 234)

Westinghouse Electric & Manufacturing company announces the appointment of **Thomas I. Phillips** as head of the company's Pittsburgh Divisions.

A Westinghouse employee since 1915, Mr. Phillips succeeds **A. C. Streamer**, who has been named assistant to the president of Westinghouse. He has held many positions with the company in his 28 years of service, including those of general works manager, assistant to the president in charge of a headquarters manufacturing staff and as a vice-president since 1941

Thomas I. Phillips

George T. Howard, sales engineer handling small tools and gages for the Pratt & Whitney Chicago office, died September 24, according to a company announcement. He was 39 years old.

Mr. Howard had been associated with Pratt & Whitney since 1933 as an inside man at the Chicago office and later as trade sales engineer. THE END

CLASSIFIED ADVERTISING

THE TOOL ENGINEER
2842 W. Grand Blvd. Detroit, Mich.

SITUATIONS AVAILABLE

TOOL DESIGNER

Carrier Corporation has an opening for a tool designer, experienced in jigs, fixtures, and special machines.

The Corporation is now engaged 100% in war work and has an active post-war program.

A statement of availability is required. Address reply to Mr. T. M. Cox, Jr., Carrier Corporation, Syracuse, New York.

NEW LINES WANTED

TOOL AGENCY

Wanted: Small tool sales agent or agency to handle adjustable limit snap gages. Liberal commission and exclusive territory. Refer to Box 785, THE TOOL ENGINEER.

A manufacturer's agent located in Chicago desires connection offering good post war future. Well established in the Illinois trade area with an enviable sales record in the cutting tool field. A graduate engineer, competent and experienced in technical sales and service. Box 786, THE TOOL ENGINEER.

WANTED: ADDITIONAL LINES ESTABLISHED REPRESENTATION FOR YOUR PRODUCT

Old established agency, well known in Chicago territory, desires to handle exclusively additional lines of production precision metal cutting tools and related equipment. Box 784, TOOL ENGINEER.

SPEED UP YOUR DRILLING

Drills more holes per minute.
Drills holes from 1/32" — in some metal to 3/8".
Used singly or in multiples.
Mounts on any angle.
Has in-built brake.
Quickly removable for other work.
Doesn't break small drills.

GET MORE HOLES FOR THE COST OF ONE

GOVRO - NELSON

PROVEN PROTECTIVE CENTRIFUGAL FEED DRILL UNITS

HOLE ENGINEERING SERVICE
5901 Fourth Ave. Detroit 2, Mich.

THREAD MILLING CUTTERS
COMBINATION CUTTERS &
CIRCULAR THREAD CHASERS

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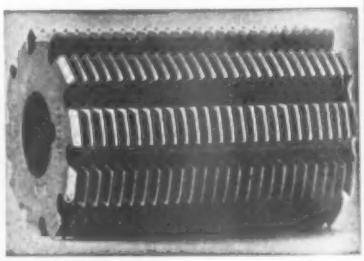

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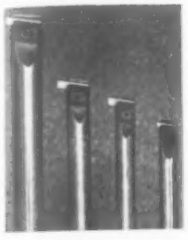

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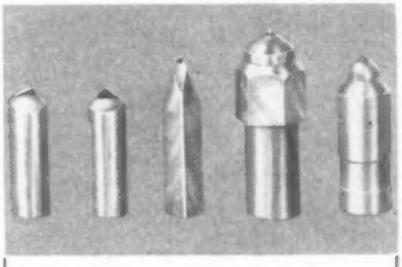

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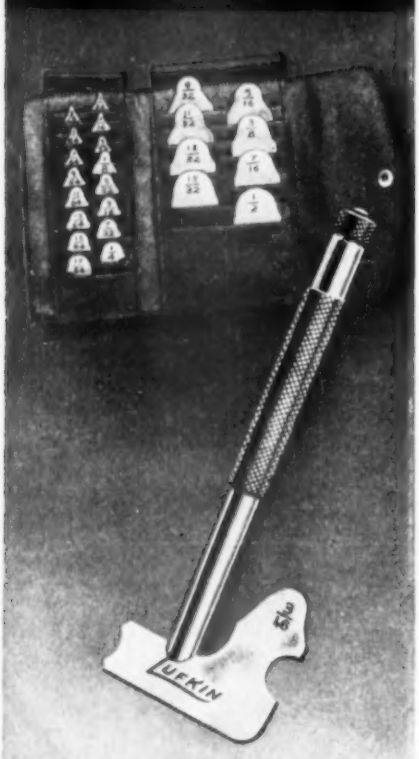

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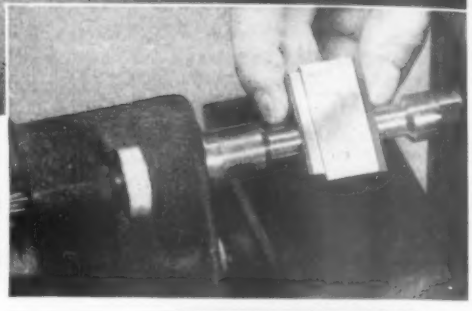

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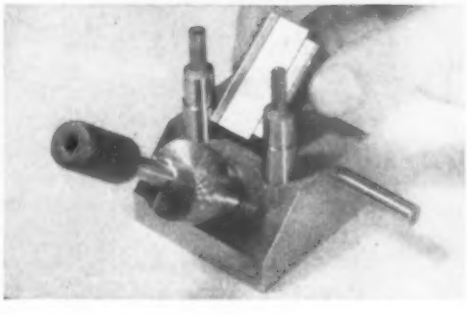

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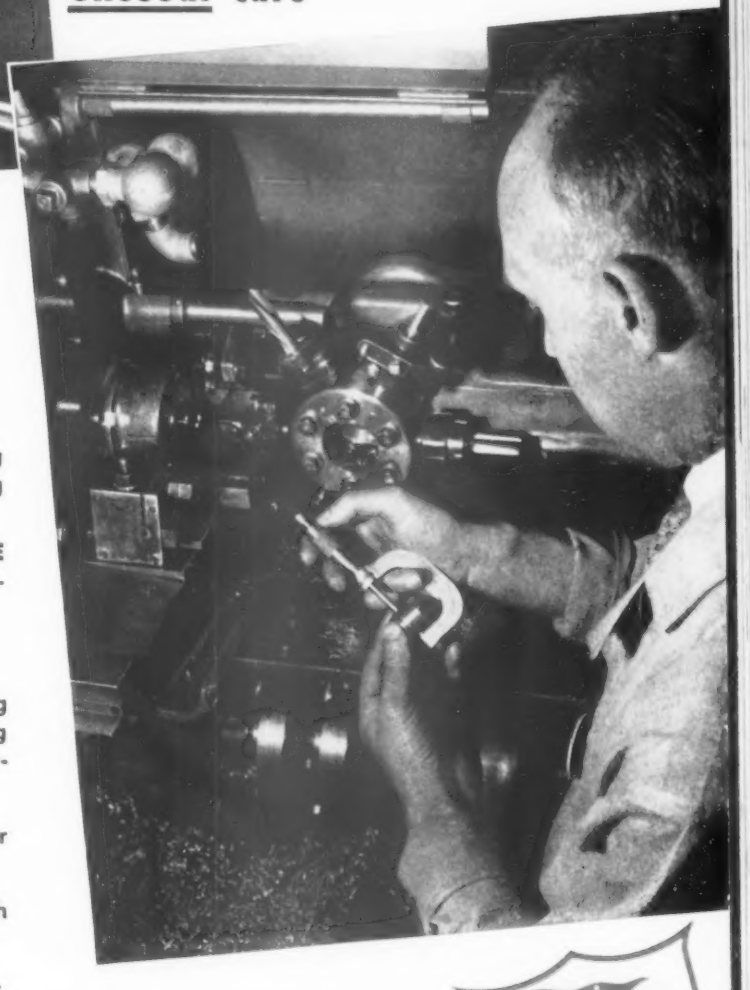

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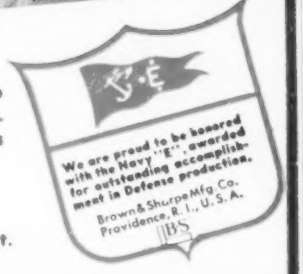
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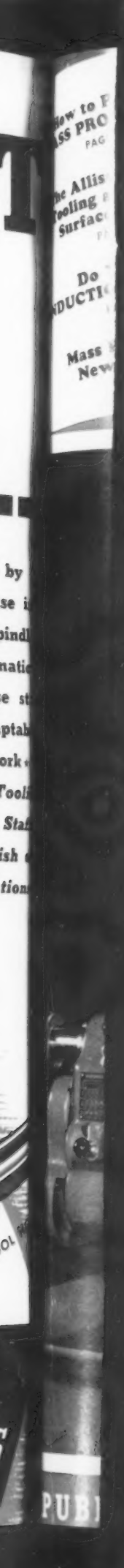
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